



Integrated Urban Regeneration and Water Transport System (IURWTS) in Kochi

Detailed Project Report on Elamkulam Sewerage Project for Chilavanoor and Perandoor Canals South Catchment

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Integrated Urban Regeneration &
Water Transport System



Antea Group
Antea Nederland. Antea India



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EXECUTIVE SUMMARY OF DPR FOR ELAMKULAM SEWERAGE SYSTEM & STP

The Govt of Kerala's Coastal Shipping and Inland Navigation Department [CSIND] conceived the "Integrated Urban Regeneration and Water Transport System" [IURWTS] during 2018 to preserve the valuable river ecosystem blessed by Mother Nature. The project objectives comprise two distinct components for holistic regeneration as itemized below:

- Restoration and Rejuvenation of five major dilapidated canals and canal catchment.
- Urban Regeneration of the canals for flood mitigation and restoring the canals for navigation to enhance last-mile connectivity, and providing pollution-free rivers

The IURWTS project covers **32.13 Sq.km** in **74 wards** of the Kochi Corporation and 11.81 sq.km area in the three contiguous Municipalities of Kalamassery, Thrikkakkara and Thripunithura. The targeted Urban Regeneration Component (URC) entails strengthening of the sanitation system in the IURWTS project area comprising Kochi Corporation and three other Municipalities. GoK's CSIND Department accorded administrative sanction for INR 1528.27 crores vide G.O (Ms) no 1/2021/CSIND dated 12 Feb 2021 for the IURWTS Project which caters outlay of INR 393.13 crores for Urban Regeneration Components [URC]. The objective of URC is to provide sewerage system to regenerate the five canals in IURWTS catchment area and ensure sewer connectivity to cent percent individual households confining only isolated houses to on-site treatment options. The SPV formed with Kochi Metro Rail Limited [KMRL] as the Nodal Agency will take up the project implementation funded by Kerala Infrastructure Investment Fund Board [KIIFB]. The SPV involves all stake holder departments to synergise the project implementation and addressing post operation & maintenance activities avoiding actions in silo. The laying of sewer network in the project area and construction of 4 Nos of adequate capacity Sewage Treatment Plants [STP] will ensure holistic sewage interception, collection, conveyance, transport and treatment to comply with the requirements of URC.

The existing sewer network facility available in Kochi area is only for **5% of the households** and the remaining area is served by soak pits and septic tanks. The septic tank systems mostly malfunction due to inept design or poor maintenance and excess flow discharged into the storm water drains leading to the main canals. The high ground water table conditions can cause hydraulic failures contaminating groundwater, nearby water source and canals/ rivers. Accordingly, the Sewerage Project DPRs have been formulated in four modules by KMRL by engaging Consultancy Services of Antea Group. The project vetting is entrusted to **Centre for Urbanization Buildings and Environment (CUBE)**, a unit IIT M Unit and the Centre of Excellence (CoE) of GoTN. IURWTS project catchment area of about 80% lies within Kochi corporation limits and the remaining 20% in three municipalities [Kalamassery, Thrikkakkara and Thripunithura Municipalities]. The total project area of 42.14 sq.km is comprised in four Urban Local Bodies [ULB] as itemized below:

- (i) Bulk of 31.07 Sq.km forms part of Kochi Corporation.
- (ii) Remaining area of 11.07 sq.km on the eastern side falling in three municipalities.

The composition of the total 95 wards catered under IURTWS project area in the four constituent ULBs [Kochi Corporation & 3 other municipalities] are:

- (i) 50 wards in Kochi Corporation,
- (ii) 21 wards each in Kalamassery and Thrikkakkara municipality and
- (iii) Parts of 3 wards in Thripunithura municipality.





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The IURWTS Catchment Area comprises six zones covering the tributary areas in northern and southern parts of three canals [Edapally, Chilavanoor & Thevara-Perandoor]. The intervening ridge along NH544 in the west-east direction is the boundary and dividing line of the catchments. The Detailed Project Reports for the four-sewer network system and STPs prepared and submitted to KMRL was with 10 MLD STP each at Vennala and Elamkulam, 7 MLD STP at Muttar and 4 MLD STP at Perandoor, adopting base year as 2021. KMRL, **before final submission to KIIFB**, transmitted the DPRs prepared by consultant for design vetting by CUBE-IIT M Research Park.

CUBE's vetting observation catalysed revision of Population projection from **base year 2021 to 2025**, as per the guidelines of "CPHEEO Manual on Sewerage & Treatment System, 2013". KMRL and KWA by mutual discussion decided to adopt population forecast under KWA's Sewerage Master Plan for Kochi city and its Urban Agglomeration. Pursuantly, the population projections done under the Master Plan of KWA is adopted in this project. The population projection and sewer load calculations got revised by KMRL as per KWA's Sewerage Master Plan with Ultimate design horizon as 2055 [Base Year: 2025 and Intermediate horizon: 2040]. The sewage loads of the left-out area of Kochi Corporation adjoining IURWTS areas are also calculated as per KWA Master Plan and the ultimate capacity of STPs computed. As such, the IURWTS project scope revised by increasing the design Capacity of STPs by harmonising the tributary areas of KWA and its sewage load by synergising the flows into the proposed 4 STPs [Vennala, Muttar, Elamkulam and Perandoor]. Hence, there is a paradigm shift in Collection System design and STP capacities of original DPRs from 31 MLD to 77 MLD by adding contiguous left out areas of KWA as shown below:

Table 1: Sewerage Zones/systems, Catchment Area and STP Capacities

S. No	IURWTS Project Area	Sewer grid Length-km (IURWTS)	Area sq.km	No. of Blocks		No. of SPS		Ultimate STP capacity in MLD	
				Old	New	Old	New	DPR Original	DPR Modified
1	Vennala system – Zone 1 (Covering part of Kochi Corporation, part of Kalamassery/ Thrikkakkara / Thripunithura Municipalities)	185 km	15.14	27	9	27	5	10	24
2	Muttar system- Zone 2 & 3 (Covering part of Kochi Corporation, part of Kalamassery Municipality)	104 km	4.00+ 4.92 =8.92	21	5	21	2	7	16.5
3	Perandoor system- Zone 5 including Vaduthala Zone (Covering part of Kochi Corporation)	67 km	5.35	8	2	8	1	4	19
4	Elamkulam system- Zone 4 & 6 (Covering part of Kochi Corporation)	135 km	8.67+ 4.06= 12.73	24	9	24	9	10	17.5
	Total	491 km	42.14	80	25	80	17	31 MLD	77 MLD





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Hitherto, vetting clearance accorded by CUBE to KMRL for 2 Nos of Revised Detailed Project Reports comprising Perandoor [Est cost: Rs137 Cr for 67 km Collection system and Rs 79.01 Cr for 19 MLD STP including Vaduthala Zone] and Muttar Sewerage Projects [Est cost: Rs 226.18 Cr for 104 km Collection system & Rs 74.15 Cr for 16.5 MLD STP. There is an existing sewerage scheme in Zone 4 owned by KWA with STP capacity of 4.5 MLD [Operational: About 3.0 MLD] which covers only 5% of the Kochi Corporation. Hence a new sewerage scheme is proposed under Kochi Corporation to cover the South catchment areas of TP canal and Chilavanoor canal delineated as IURWTS Zone 4&6. The design population and average sewage load generated as per sewer grid design is summarized below:

Table 2: Area Coverage and population served for Elamkulam STP (IURWTS)

S. No.	Corporation / Municipalities	Area Sq.km	Population 2011	Base Year2025			Intermediate Horizon 2040		Ultimate Horizon 2055	
				Popn	Q MLD	House-holds	Popn	Q MLD	Popn	Q MLD
Chilavanoor Canal South Catchment										
1	Kochi Corporation	4.93	35049	38046	7.16	7609	41539	7.71	45355	8.33
TP Canal South Catchment										
2	Kochi Corporation	3.66	32435	35207	6.28	7042	38441	7.14	41971	7.71
TOTAL		8.59	67484	73253	13.44	14651	79980	14.85	87326	16.04

The population as per 2011 census of Elamkulam-Zone 4 & 6 is 67484, and the projected population for the Base year [2025] is 73,253, Intermediate [2040] 79980 and Ultimate horizon is 87326. The estimated sewage load is 16.04 MLD to serve 14651 households. Elamkulam sewerage areas of KWA/ KMRL include 14 divisions of Kochi Corporation. It's culled out expediently by the expertise of KWA/KMRL to ensure holistic coverage of URWTS catchment by KMRL and the left out portions by KWA. The sewage load of 49.06 MLD from the entire Elamkulam sewerage zone is to be treated entirely in KWA's Elamkulam STP site. It entails three new STPs of 17.5, 15 and 10 MLD capacity. KMRL will install 17.5 MLD STP to treat IURWTS project catchment and contiguous KWA left-out areas, duly homogenising the flows after joint discussion of KWA and KMRL experts. The reallocation of sewage load among KMRL and KWA has been done by consensual decisions compatible to the computed capacity of STP without criss-crossing of sewer lines. The estimated sewage load [Ultimate:2055] for the IURWTS catchment under Elamkulam System is 16.04 MLD and that under KWA considered in the design of all the 9 Zones is 4.42 MLD. Accordingly, STP capacity of 17.5 MLD is provided by KMRL including KWA-left out areas as per their Master Plan. The additional sewage load of KWA areas factored in the collection System Design by KMRL as in Table 3. The entire sewage load as per design requirements will be amiably integrated in the battery of STPs in Elankulam under KMRL and KWA.





Table 3: Sewage load of Elamkulam STP

S. No	STP Zone	Projected Sewage Generation/Load in MLD		
		Base year 2025	Intermediate 2040	Ultimate 2055
1	Elamkulam Blocks 5 to 13 (KMRL) as per Sewer Grid Design	13.78	14.85	16.04
2	KWA Areas considered in design	4.12	4.25	4.42
Daily Sewage Load		17.90	19.10	20.46 MLD

The sewer network caters South catchment areas of TP and Chilavanoor canals admeasuring 8.59 Sq.km, flanking on its eastern and western sides. The TP canal south catchment (Area:3.66 Sq.km) starts from NH 544 and ends at Thevara having North-South flow direction. The Chilavanoor south catchment (Area:4.93 Sq.km) starts from NH 544 and ends at Elamkulam and having a flow direction in the North South direction. The population density of Kochi Corporation as per 2011 is about 6672 persons/ sq.km. The sewer network caters to parts of 14 Divisions (39,44,45,52,53,55,56,57,60,62,63,64,65,66) of Kochi Corporation.

The STP site owned by KWA located in Elamkulam near Chilavanoor Canal South is found suitable for a new STP for Elamkulam zone of IURWTS Project. The land is having a total extent of 3.14 Hectares. The Elamkulam STP is located at latitude 9° 58' 16.47" N and longitude 76° 18' 23.04 E" in Chilavanoor canal South catchment. It is located at 0.6 Km from Kochi Metro station at Elamkulam and at a distance of 25Km from Kochi International airport and 2 Km from the nearest Ernakulam South railway station in the project catchment. The land is having plane topography and the ground water table is at a higher level. KWA has completed a new STP of 5 MLD under AMRUT Scheme at Elamkulam which is being commissioned to serve the existing network. Further for upgradation of the existing outdated STP and meet Master Plan requirements of Elamkulam zone, additional capacities of 17.5 MLD by KMRL and 10 MLD by KWA is proposed in the same site adjacent to the new AMRUT STP of 5 MLD. The consent given for constructing a new STP by KMRL is same as the location of old STP site.

This Elamkulam IURWTS Sewerage Project contemplates Collection System comprising sewer network / appurtenances for 135 km and STP of 17.50 MLD capacity to comply the stringent standards of KPCB/CPCB in the existing STP premises of KWA [in place of 4.45 MLD STP]. The rigorous redesign of Sewerage system reimagined the sewer grids diligently during CUBE's vetting process. It resulted in reducing the Blocks from 24 to 9, Pumping stations from 24 to 9 Nos [7 New+2 Existing] and Lift Manholes from 538 to just 7 Nos [Refer Fig 2] with resultant cost savings enormously in CAPEX and OPEX. The detail of tributary Blocks considered in the Elamkulam sewerage system under the 9 Tributary Blocks is itemized below:

Raw Sewage is collected from the following Blocks detailed below:

1. Block 5 -TM joins by gravity in WW4 and then pumped to WW5 at STP site.
2. Block 6-TM joins by gravity into the Wet-Well WW5 at STP site and pumped to STP.
3. Block 7-TM ends by gravity in LIM and then lifted to Wet well WW3(PM:180 m) proposed at Thevara under IURWTS project which is relay pumped to KWA's newly proposed Cheruprambathu well. (PM3:200DI/K9, 2.55 km)
4. Block 8-TM joins by gravity in MH (GN-8CR RD M7) and lifted (PM: 30 m) to Cheruprambathu well.





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5. Block 9 TM ends by gravity in the Manhole and collected in existing Muttathil Well
6. Block 10-TM joins in a Manhole are collected by gravity (L:200 m) in the newly proposed KWA well- Padiyath Wet-well
7. Block11- TM joins in a MH are collected by gravity in existing KWA MG Road well (L:200 m)
8. Block 12A-TM ends by gravity in Wet well WW1 at Kaloore and pumped to Wet well WW2 (PM1:300DI K9 2.03 km)
9. Block 12B-TM ends by gravity in Wet well WW2 at Kathrikkadavu and pumped (PM2:350DI K9, 3.5 km) directly to STP Inlet Chamber
10. Block 13-TM ends by gravity in LiM (TR RD M10) and lifted (Pm: 277 m) to the KWA's newly proposed Thammanam well.

The Collection system entail street sewers, branch sewers, Trunk sewer Mains, Manholes and Lift / Pumping stations to intercept, collect, convey and transport the sewage load generated to the STP for treatment. The sewer pipes range from 200 mm DWC SN 8 pipes to 630 mm HDPE PN8 pipes.

KWA has five collection well cum pumping stations in their own lands and KMRL proposed two Collection well cum pumping stations at Thevara and at Kathrikkadavu near Kattaikanal bridge which require land acquisition of 0.061Ha each. The KMRL sewer- network design factors 9 Pumping Station/ Wet-Wells in the sewer network (KMRL:4 & KWA:5) including 2 existing Wet-Wells/ Pumping stations of KWA at MG Road, Muttathil lane. The new proposed wells under KWA are at Cheruprambathu, Padiyath, Thammanam, besides two existing. KMRL also proposes 4 other Pumping Station / Wet-wells (WW1 to 4) including WW3 Thevara which is found essential to drain KMRL and KWA areas / surrounding in the southern side of Thevara Canal. The Collection System details are summarized below for quick glance of the components covered under the scope of Elamkulam Sewerage system:

Table 4: Elamkulam STP Catchment/ Block-wise and Collection System Details

S. N. O.	Catchment Area - Zone	Tributary-area/ Blocks	Sewer length km	House No.	Sewer Appurtenances		
		Description Block No.		HSC	MH	LiM	SPS
1	Zone 4- Chilavanoor South	BLOCK 5	19.77	2203	837	1	1 (VWV4)
		BLOCK 6	11.31	756	489	1	
		BLOCK 12A	27.21	3059	1036	2	1(VWV1)
		BLOCK 13	5.91	869	223	-	1(KWA)
2	Zone 6-TP Canal South	BLOCK 7	2.66	412	104	1	1(VWV 3)
		BLOCK 8	28.82	3272	1132	2	1 (KWA)
		BLOCK 9	6.87	835	252		1 (Ex)
		BLOCK 10	2.65	238	100	-	1(KWA)
		BLOCK 11	3.29	507	122		1 (Ex)
		BLOCK 12 B	26.59	2500	1013	-	1(VWV 2)
	Total		135.08	14651	5308	7	9





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The Components of STP including design, execution, commissioning and trial run with O & M for 10 years is to be implemented under DBOT mode to procure STP with latest standards and specifications. The Electro-mechanical devices and pumping plants of Collection system and STP are designed for 15 years and Civil structures for 30 years considering the service life. The proposed STP of 17.5 MLD capacity is based on automated SBR Technology adopting N-P removal design, prudently selected from the proven Technology menu. The SBR is preceded by hierarchy of preliminary treatment comprising set of Fine/Coarse screens, Grit removal, post-treatment for sludge dewatering/thickening and disinfection by Chlorination until outfall point. The latest Turbo Aeration system with SS 316 decanters, compatible diffuser modules with air grid manifolds / laterals and Screw Press Technology is proposed for sludge dewatering/thickening to enhance energy savings with ease of maintenance and functional efficacy. The latest Turbo Aerators/Blowers with non-contact Air foil bearings in place of lobe blowers consume less power and makes it suitable for STPs in residential areas due to low vibration and less noise. The treated effluent shall achieve BOD < 5 ppm, COD < 100 ppm, TSS < 10 ppm, to get recyclable quality of water for industrial / agricultural purposes or regeneration into rivers.

The Estimate for the Elamkulam Sewerage System and STP for Zone 4 & 6 is prepared based on PRICE Software of GoK using DSR 2018 with applicable Cost index.

1. The Estimate for Collection System of Elamkulam IURWTS Project includes laying of sewer lines [135 Km], Construction of Manholes [5308Nos], Lift manholes [7 Nos] Sewage Pumping Station [5 Nos], Pumping Main 4 Nos [PM1-300 DI K9 – 2.03 km for WW1 to WW2 & PM2-350mm DI K9 - 3.5km for WW2 to STP & PM3-WW3 to existing KWA WW -2.55 km] PM4 -WW4 to STP 300mm DI K9-300m and providing Household Sewer Service Connections [14651 Nos].

(a) The total Estimate cost for Collection System including GST 18% is INR **265.84 Crores**.

(b) Collection system Cost of Rs 265.84 Crores includes Capital Cost of Rs 242.72 crore and **Operation & Maintenance cost [10 years]** @ Rs 23.12 crore [O&M: Rs 18.47 crore & Energy cost: Rs 4.64 crore].

2. The Estimate Cost for components in STP site includes the components of 17.5 MLD STP including Wet-Well [1 No] for Collection of Raw Sewage from Block 6 at STP site:

(a) The Estimate cost for Components in STP site including GST 18% is INR **74.82 Crore**

(b) The STP Cost of Rs **74.82 crore** includes Capital cost of INR. **45.50 Crores** and 10 year **Operation & Maintenance cost** of Rs 29.32 Crores [O&M: Rs 18.10 crore & Electrical Energy: Rs 11.22 crore].

3. The total project cost is projected as INR **367.63 Crores** [by KMRL] including land acquisition for pumping station [15 Cents for Thevara Wet well], 15 cents for WW2 at Kathrakkadavu WW4 and allied overheads of DPR Preparation and Supervision charges for project execution. The project financing is from KIFB, Government of Kerala.


Antea Group
Team Leader


General Manager
KMRL


Mr. Gen L Padmanaban
[Retd.] CEO, CUBE

Fig 1: Elamkulam Sewerage System Block Map showing Cardinal Details





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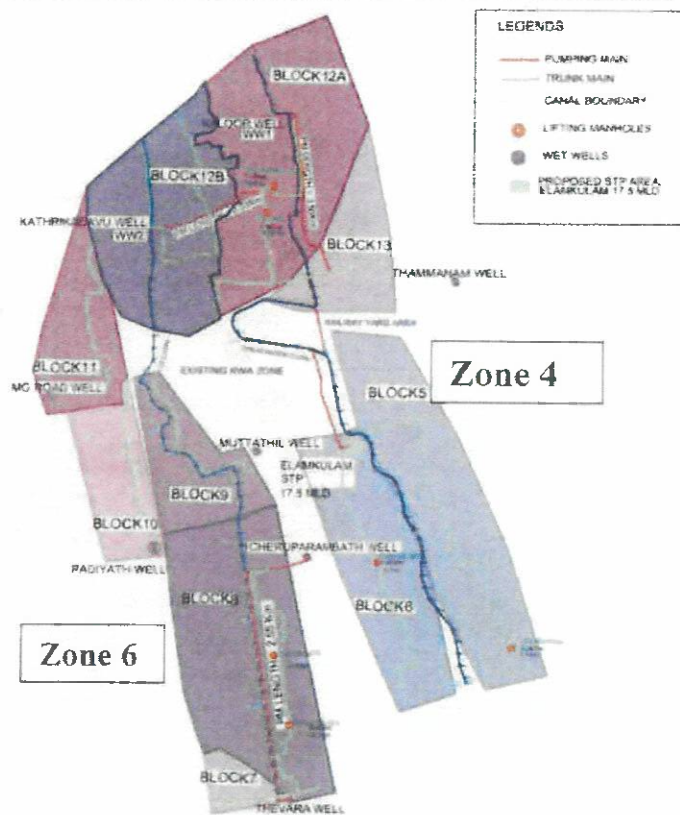


Fig 2: Impact summary of final design vetting by CUBE for Elamkulam zones

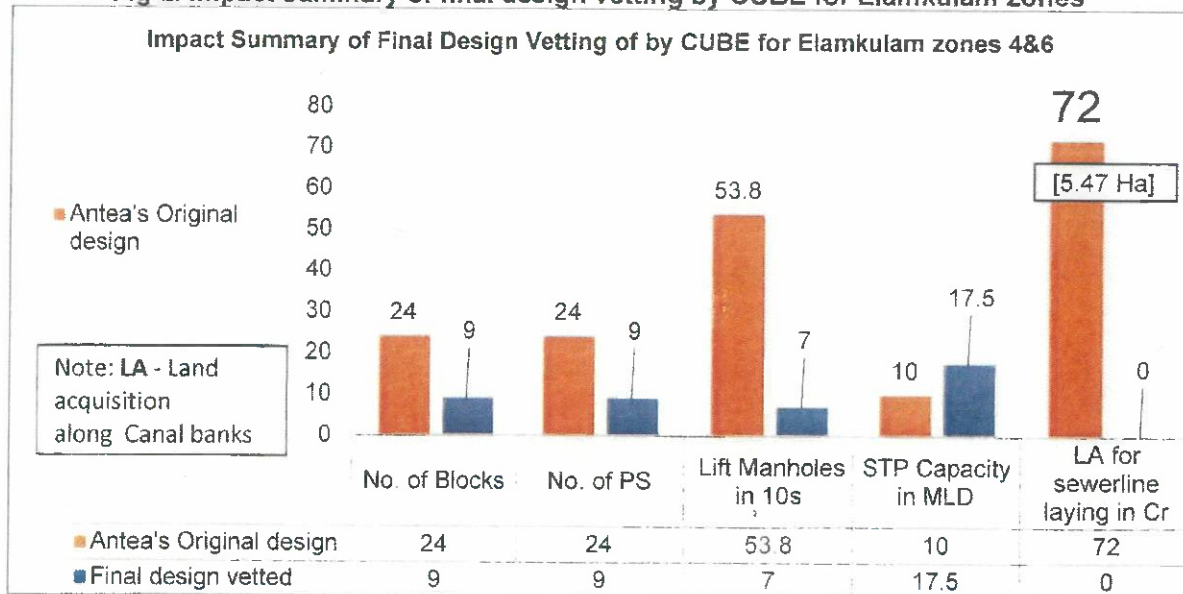


Fig 3: Flow diagram of Elamkulam System:



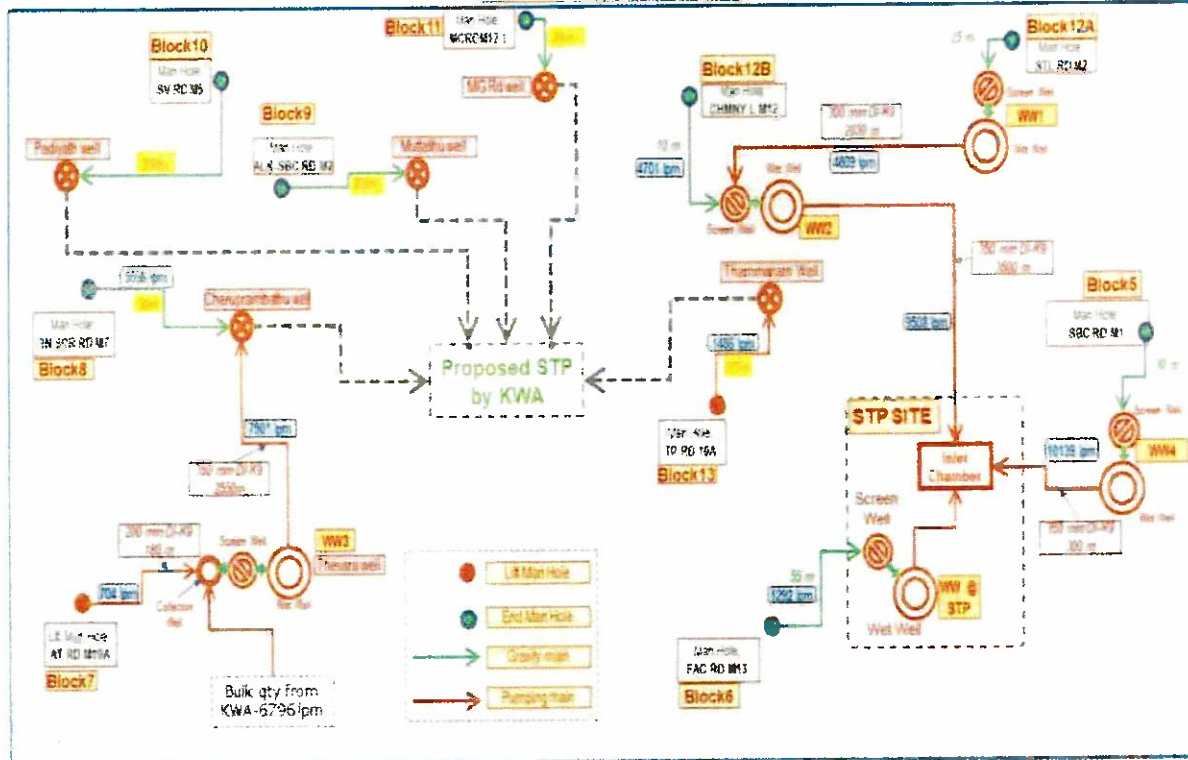



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Elamkulam System





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Water Transport System



Antea Group

Antea Nederland. Antea India

General Consultancy Services for Integrated Urban Regeneration and Water Transport System, Kochi, India

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General Consultant – IURWTS Project

Antea Nederland B.V. and Antea India Pvt. Ltd. (JV)

Client :

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Executive Summary

Kochi is a metropolitan city lies in Ernakulam District surrounded by back waters. In the past decades the urban population was increased in a rapid rate which results in an increase of urban poor. Urban sprawl, unplanned development, encroachment into the canal commands, flooding, solid waste management, lack of sewer facilities resulting in water and air pollution issues, are the list of woes faced in the Kochi urban fabric. In addition, Kochi city being a coastal/riverine city climate change impact has also become a major contributing factor to climate induced devastation.

The “Integrated Urban Regeneration and Water Transport Studies” (IURWTS), a project for rejuvenating the existing dilapidated five canals of Kochi city, was conceived by CSIND, Govt of Kerala in the year 2018, as a part of improving the quality of life in Kochi city in line with the directives of the Ministry of Urban Development, Government of India. The Detailed project report was prepared for an estimated amount of INR 1528.27 crores and administrative sanction issued by CSIND dept, Govt. of Kerala vide G.O (Ms) no 1/2021/CSIND dated 12-02-2021.

The IURWTS project has 2 main components of which one is restoration of the five major dilapidated canals and canal catchment thereby mitigating floods, restoring the canals for navigation to enhance last mile connectivity and provide pollution free water bodies. The second component of the project includes urban regeneration of the canal banks by providing household sewer connectivity and adequate capacity sewage treatment plants and thus maintaining the restored canals, free of contamination.

The IURWTS project consists of 3 major canals and a minor canal, Thevara canal and manmade canal-Market canal. Their catchments are delineated. The catchment area of Thevara canal falls inside Thevara-Perandoor and hence it is treated as a single catchment for calculation of sewer loads generated. The catchment map is overlaid with the wards map and the individual catchment is clipped to assess the population contributing to the respective canals. The NH-544 forms a ridge line cutting the catchment in the east-west direction. The wards falling on the southern side and the northern side catchments of the 3 canals (Thevara-Perandoor (combined), Chilavanoor and Edappally) was segregated. Based on the population projections estimated till 2055 the sewer loads were calculated for the catchment areas on the northern and southern side catchments using Sewer DEM software.

Consultant: 	DPR: Sewer network & Elamkulam 17.50 MLD	Project: IURWTS	Client: 
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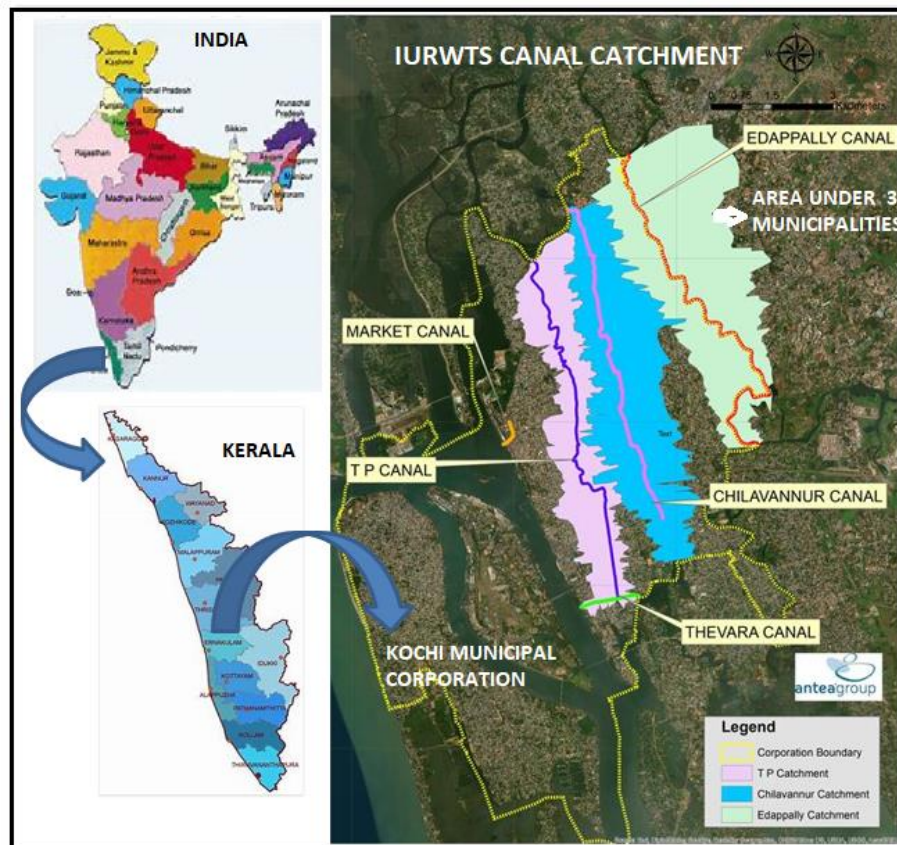


Figure 1: Physiographic setting of IURWTS Catchment

Since Edappally canal has three municipalities on the eastern bank, portions of these municipalities should also be considered for planning Sewerage system in the north and south catchment area of Edappally Canal. At Muttar STP, only northern catchment area of Edappally canal is taken in which left bank is part of Kochi corporation and right bank is part of Kalamassery Municipality. For the north catchment area of other two canals Chilavannur Canal and Thevara Perandoor Canal is Kochi Corporation.

About 80 percent of IURWTS project command lies inside Kochi corporation limits, i.e., out of the total catchment area of 43.93 sq.km, 31.07 Sq.km forms part of Kochi Corporation and an area of 12.857 sq.km on the eastern side falling in 3 municipalities (Kalamassery, Thrikkakkara and Thripunithura Municipalities). Out of 74wards of Kochi Corporation, 50wards (parts or fully) fall under IURWTS project including 20 wards (parts or fully) each in Kalamassery and Thrikkakkara municipality and parts of 3 wards in Thripunithura municipality. Chilavannur canal and Thevara-Perandoor canal, only Kochi Corporation lies on both the banks.

Kochi corporation includes 74 wards having a total area of 94.88 Sq. Km. The corporation area lies between 9°58'N Latitude and 76°16' E longitude. Most of the corporation area lies at or below MSL and 40 percent of the surface area consists of water sheets formed by canals and lagoons of Kochi Estuary. As per census 2011, the total population of Kochi Corporation is 633553 and number of households are 158535.

Kalamassery Municipality has 42 wards with total area of 28.00 Sq.km. It locates at latitude 10°3'7.09"N and 76°18'56.78"E longitude. About 60 % of the municipal area is having uneven topography and hard soil strata. As per census 2011, the total population of Kalamassery Municipality is 71038 and number of households are 17844.



Thrikkakkara Municipality has 41 wards with total area of 27.00 Sq.km. It locates at latitude 10° 2' 6" N and 76° 19' 44.4" E longitude. About 60 % of the municipal area is having uneven topography and hard soil strata. As per census 2011, the total population of Thrikkakkara Municipality is 77319 and number of households are 19348.

Thripunithura Municipality has 49 wards with total area of 29.17 Sq.km. It locates at latitude 9° 57' 9.96" N, 76° 20' 19.22" E longitude. As per census 2011, the total population of Thripunithura Municipality is 92550 and number of households are 24015.

About 80 percent of IURWTS project command lies inside Kochi corporation limits, i.e., out of the total catchment area of 43.93 sq.km, 31.07 Sq.km forms part of Kochi Corporation and an area of 12.857 sq.km on the eastern side falling in 3 municipalities (Kalamassery, Thrikkakkara and Thripunithura Municipalities). Out of 74wards of Kochi Corporation, 50wards (parts or fully) fall under IURWTS project including 20 and 21 wards (parts or fully) each in Kalamassery and Thrikkakkara municipality and parts of 3 wards in Thripunithura municipality.

For providing sewer network connectivity, the IURWTS catchment has been divided into 6 zones and the dividing line of the catchments being the national highway running on a ridge of the catchment in the west-east direction

The existing sewer network facility is only available for 5 percent of the households and the remaining area is served by soak pits and septic tanks. The excess flow from these units is discharged into the storm water drains and thereby drained into the main canals. As per this project an effective sewerage system is proposed to be implemented for the treatment of all sewers loads from households, flats, and commercial buildings.

Consultant: 	DPR: Sewer network & Elamkulam 17.50 MLD	Project: IURWTS	Client: 
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Initially for IURWTS Project, five numbers of Sewerage Treatment Plants were suggested at the tail ends of the canals to avoid the effect on urban life. The locations are Vennala, Muttar, Puthukkalavattom, Perandoor and Elamkulam. Later Puthukkalavattom location was cancelled due to insufficient land area. Hence sewer load of 2MLD planned to Puthukkalavattom STP is proposed to be conveyed to Muttar STP by increasing its then calculated capacity of 5MLD to 7MLD. Detailed Project Reports for four STPs and sewer network system were prepared and submitted to KMRL with 10MLD STP at Vennala and Elamkulam, 7 MLD STP at Muttar and 4MLD STP at Perandoor, which were then forwarded to M/s. CUBE-IIT for vetting before final submission to KIIFB.

On verification, M/s. CUBE-IIT has insisted that the basic data of Population projection shall be either of master plan or city development plan or from an authenticated source as the census population after 2011 and population details from Corporation/Municipality officials were not available. The base year shall be taken as 2025.

Kerala water Authority (KWA) is the only one nodal agency in Kerala State for the maintaining and implementation of various water supply and sewerage Schemes. KWA has prepared a master plan for the year 2051, projected from the census population 2011, for Kochi city and the surrounding municipalities, the urban Agglomeration, for water demand which consists of floating population, industrial and commercial water demand, and unaccounted water loss. Based on water demand, sewer load generation was also calculated including ground water infiltration. As per the joint discussion with KWA and KMRL, it was decided that the sewerage schemes if proposed for Kochi should be in an holistic approach covering to a maximum extent. Hence, the sewer load generation of KWA area is also to be included for finalizing the treatment capacity in individual STPs under IURWTS project and is done accordingly.

Since the STPs were decided as common to both IURWTS and KWA sewerage schemes. The sewer loads of the left out area of Kochi Corporation which are to be considered by KWA are also calculated and included to find out the ultimate capacity of STPs.

Hence the population projection and sewer load calculation were revised according to the KWA MASTER PLAN for Kochi city and adjoining municipalities (Kochi Urban agglomeration) and the population and sewer load of the IURWTS catchment areas were computed up to a projected year of 2055 as directed by CUBE-IIT ,Chennai.

<p>Consultant:</p> 	<p>DPR: Sewer network & Elamkulam 17.50 MLD</p>	<p>Project:</p> <p>IURWTS</p>	<p>Client:</p> 
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THIS DETAILED ENGINEERING REPORT is a revised report (R2) of submitted Elamkulam STP which is now proposed for treatment of sewer load generated in Chilavanoor canal and Thevara-Perandoor canal Zone 4 and Zone 6 - South catchment areas and the left out portions which are under the control of KWA . The projected population and sewer load calculations are based on MASTER PLAN of KWA and sewer network design is being done only for IURWTS Project area and capacity of STP was calculated for total area of IURWTS Project and KWA area in the ultimate year of 2055. Directions from M/s. CUBE-IIT had also been taken in redesigning process of network area.



This report relates to the implementation of the sewer network for south catchments of Chilavanoor and Thevara-Perandoor canals and construction of an SBR technology-based Sewage treatment plant of 17.50 MLD at Elamkulam on the southern catchment of Chilavanoor canal as part of the urban regeneration component of IURWTS project. The land for the STP serving eastern and western side of southern catchment of Chilavanoor canal and TP canal has been identified at Elamkulam, the existing STP site owned by KWA for an area of 3.14 hectares. In Elamkulam zone KWA is also proposing two more STPs of 15 MLD and 10 MLD treatment capacities, the covered area is shared by KWA and KMRL after joint site inspection and discussions.

As per the master plan for Elamkulam Zone, KWA has included 5 pumping collections well cum pumping stations in their own lands including full utilization of two existing wells at MG Road and Muttathil lane. Near Thevara canal, one new well is found essential for collecting and conveying sewer load generated in the southern side of Thevara Canal and surroundings and KMRL has proposed a new collection well for collecting load from KMRL and KWA areas. The sewer load generated on the east side of Chilavanoor canal catchment is designed to collect in a new collection well proposed in KWA land along SC Bose Road Two more wells at Kathrikkadavu and near stadium Kaloore are found essential and are also within the scope of IURWTS Project.

This report includes design and estimate of sewer network included in the IURWTS Project of 16.03 MLD with necessary sewer appurtenances and 17.50 MLD STP at Elamkulam STP site of KWA as upgradation of the existing 4.45 MLD KWA Sewage Treatment Plant at Elamkulam.

Cost Summary of the Sewer network for 17.50 MLD plant with appurtenant structure details for Thevara-Perandoor canal and Chilavanoor Canals South Catchment amounts to,

- 1) Design and build SBR Sewage Treatment Plant of 17.50MLD installed capacity and all appurtenant structures and allied works including Operation & Maintenance for a period of 10 years including defect liability period of 24 months – **INR 74.82 Crores**

Consultant: 	DPR: Sewer network & Elamkulam 17.50 MLD	Project: IURWTS	Client: 
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- 2) Build new underground sewerage network for 16.03MLD with interception sewer (manholes 5308 nos. and lifting stations 7nos.) of about 135 km sewer length three pumping mains of 300mm and 350mm diameter DI class K9 pipes and Four collection wells cum pumping stations at Thevara, Kaloor , Elamkulam (KWA owned land) SC Bose Rd and Kathrikkadavu (near Kottaikanal bridge) and all sewer appurtenant structures and allied works including Operation & Maintenance for a period of 10 years including defect liability period of 24 months – **INR 265.84 Crores**
- 3) Since the land for STP and collection wells at Kaloor and SC Bose Road are of KWA's own property, only a land transfer consent for construction is required. KMRL proposed two Collection well cum pumping station at Thevara and at Kathrikkadavu near Kattaikanal bridge 0.061Ha per well. Land acquisition proposed for an area of 0.121Ha for collection well cum pumping stations (@10.79crores/Ha) – **INR 1.31 crores.**
- 4) Preparation of Detailed Engineering Report for the Sewerage Scheme for Elamkulam Zone @1.5% of the total estimate Amount – **INR 5.13 Crores.**
- 5) Project Management / Supervision charges for the execution of the entire sewerage scheme @ 6% of the Estimate cost – **INR 20.53 Crores.**



The total project cost is thus works out to INR 367.630 Crores.

Funding for the project is from KIIIFB, Govt of Kerala, appraisal of the project has been completed by KIIIFB and the final appraisal amount will be cleared by KIIIFB after the land acquisition process is complete.

To manage this project during implementation and post implementation stage, as per the GO (Rt) No. 2010/2019/RD dated 23rd July 2019, KMRL was entrusted the job of Special Purpose Vehicle (SPV). Antea Group, Nederland was selected as the General Consultant (GC) for assisting SPV. The Scope of GC under this project involves the Planning, Design and Supervision and Project Management.

GC will ensure compliance and monitoring of the project activities using innovative tools and techniques such as online monitoring of the work sites. GC will work in close collaboration with the Municipal Corporation and the concerned stake holder departments during the execution phase of the project and will be responsible for the follow up tasks.



A separate SPV involving all stake holder departments is also proposed so that departments involved in the project command do not work in silos and implementation and post operation activities are properly address.

Consultant:  anteagroup	DPR: Sewer network & Elamkulam 17.50 MLD	Project: IURWTS	Client: 
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Appraisal Form

Checklist for Submission and Scrutiny of DPR for Elamkulam STP and Sewer network under IURWTS project



Sl. No	Description	Write 'Yes' or 'No' etc in the column below
		If Yes, give Page No./DPR volume reference. If No, reasons thereof
1	General Components (MAIN DPR OF IURWTS PROJECT)	
1.1	Name of the town/city/District/State for which scheme has been formulated with name of the scheme:	Kochi/Ernakulam/Kerala/Integrated urban regeneration and Inland Transport Studies (IURWTS)
1.2	Date of DPR appraised by SPV (KMRL) and whether a copy of appraisal report (duly authenticated by the competent authority) has been forwarded with DPR	Appraisal sheet attached as Annexure 8 of this DPR
	(a) Date of appraisal	30-01-2021
	(b) Name of the appraisal agency	Kerala infrastructure investment Fund board (KIIFB)
	(c) Original Estimated cost:	INR 1528.27 crores
	(d) Appraised cost	To be received from KIIFB after LA process is completed
	(e) Major comments/observations made by appraisal agency	No Major comments . Appraisal sheet attached as Annexure:10 of this DPR
1.3	Whether Administrative approval of State Government is obtained to implement the IURWTS scheme	Yes. G.O (Ms)no 1/2021/CSIND dated 12-02-2021 for INR 1528.27 crores Page 1 /Section 1.1 of DPR
1.4	(a) Whether Project formulation justification (need for the project) has been furnished in DPR.	Yes Justification: Page 2 /Section 1.2 of DPR
1.5	(b) Whether executive summary of the project is furnished in DPR	Yes DPR Page:1
1.6	Whether linkages of this scheme have been established with other ongoing sewerage schemes being funded by the Central/State Govt./other agencies, if any. Pl. Furnish relevant information.	NA
1.7	Whether the map showing administrative and political jurisdiction of the project area (IURWTS) has been given in DPR.	Page 16 / Figure 1 of DPR
	(a) Area within Kochi Corporation limit = 31.07 Sq.km	Page 28/Section 2.2.1
	b) Area of Kalamassery municipality limit : 5.418 Sq.km	Page 28/Section 2.2.1
	c) Area of Thrikkakkara municipality limit : 6.797 Sq.km	Page 28/Section 2.2.1
	d) Area of Thripunithura municipality limit : 0.65 Sq.km	Page 28/Section 2.2.1
	Total Extent of area considered in the DPR : 43.93 Sq.km	Page 28/Section 2.2.1
1.8	Whether the land use pattern of the project area has been given in DPR (Bureau e of Economics and statistic, Govt of Kerala)	Yes. Page 66,67 Tables 15-18
1.9	Whether the DPR including the design, drawings, cost estimates, analysis of rates has been authenticated by	To be obtained by SPV (KMRL) before tender on DBOT mode

Consultant: 	DPR: Sewer network & Elamkulam 17.50 MLD	Project: IURWTS	Client: 
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	Competent Authority of State Govt. (KMRL)/ Technical sanction of DPR by KIIFB / Technical & Financial Verification Certificate by KIIFB	
2	Whether the proposals for setting up STP received clearance / consent from the State Pollution Control Board: Consent to establish received from	Included as Annexure:9 of this DPR
2.1	In case proposed pumping main /sewer line is crossing Railway line/ Highway & their bridge (wherever applicable), whether the clearance from concerned authority such as State Pollution Control Board (SPCB), Highways, PWD, Corporation, Municipalities, Railways has been obtained and copies of the permission and their estimate for the same has been provided in DPR.	No. (Clearance from Highway and KPWD (roads) dept to be obtained)
	If not, the present status of action initiated may be furnished below.	To be obtained by SPV (KMRL) from National highway and PWD roads/Corporation/ Municipalities during execution
2.2	Whether the provision for separate electric feeder line to the sewage treatment plant and pumping stations (to take care of frequent power failure and voltage fluctuation problem) from HT line and an agreement between Kerala state Electricity Board (KSEB) and Urban Local Bodies (ULBs) has been furnished in the DPR:	No. To be obtained by SPV (KMRL) from KSEB during implementation
2.3	Whether the commitment from Electricity Department for un-interrupted power supply is obtained	To be obtained by SPV (KMRL) from KSEB
2.4	Whether the Topographic map of the city/town/project area to the scale has been given in DPR/Zone wise maps to scale showing all streets.	YES. Included as Annexure:6 of this DPR
2.5	Whether soil investigation report – bore hole logs has been appended with DPR.	Included as Annexure:4 of this DPR
2.6	Whether Contour map of the project area has been annexed with the DPR.	Included as Annexure:6 of this DPR
2.7	Whether resolution from the ULB for implementation of proposed tariff structure to ensure self- sustainability of the scheme is enclosed in DPR.	Included as Annexure:9 of this DPR
	ENGINEERING COMPONENTS	
2.8	(i) Please furnish the details of IURWTS project area,	
	(a) Total covered Area of the Kochi Corporation: 31.068 Sq.Km, Municipalities: 10.803 Sq.Km	Page 138-179/Section 7 of DPR
	(b) Extent of the project area (Perandoor south catchment , Chilavanoor canal south catchment) considered in the DPR: Kochi Corporation:	Page 138-179/Section 7 of DPR
	(c) Additional Area (beyond Corporation/municipal limit) considered in the DPR:	Sewer load of left out portions of IURWTS zones which are proposed to be covered by KWA but inaccessible without merging with KMRL is taken for sewer network design.
	(d) No. of Households (as per 2011 census) Elamkulam STP sewer area:	14651 Section III, Page 138-179
2.9	Population For Elamkulam Sewer area-Ultimate stage 2055: 87326 persons + Floating population 48029 Total 135355	Section III, Page 138-179
3.0	Population growth rate adopted 5-6%/10 years for corporation and 10-9% 12%/10 years for Municipalities	Section III, Page 138-179

Consultant: 	DPR: Sewer network & Elamkulam 17.50 MLD	Project: IURWTS	Client: 
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3.1	Demographic Method adopted and justification: Arithmetic progression method	Page 78 Section II of this DPR
3.2	(a) Whether population projection has been made as per CPHEEO Manual and given in DPR:	Yes Page 78 Section II of this DPR
	(b) Project Area (part or 100% area of the IURWTS catchment): 20.305%	Section III, Page 138-179
	(c) Ultimate stage: 87326 persons + Floating population (55% for Corporation) 48029 = 135355 total (2055)	Section III, Page 138-179
	(d) Population growth rate adopted 5-6%/year for corporation and 10-12%/10 years for Municipalities	Section III, Page 138-179
	(e) Block wise Population (Kochi Corporation/Municipalities)	Section III, Page 138-179
	(f) No. of wards (within Corporation/ municipal limit)	Section III, Page 138-179
	(g) Total projected population to be accommodated in the existing corporation /municipal area	87326 in the year 2055. Section III, Page 138-179
3.3	Whether existing details of sewerage system for urban / urban agglomeration has been furnished in DPR. Please furnish details	Existing sewerage schemes in Elamkulam zone owned by KWA
	(a) Total sewage generation in South catchments of TP canal and Chilavanoor canal from the scheme (Kochi corporation/Municipalities)	EXISTING – 4.45MLD STP owned by KWA
	(b) Industrial treated effluent (to the desired level) being discharged in the sewer system MLD	NA
	(c) Existing capacity of \Project sewer area	4.45 MLD
	(d) No. pumping stations and capacity:(MLD) (nos.)	3Nos. 1.3MLD each
	(e) % of population coverage with sewer network in the project area %	5%
	(f) % population coverage of various blocks (block -wise) w.r.t total catchment	NA
3.4	Sewage Generation	
	(a) Per capita sewage generation considered in the DPR	(85% of water supply) 123lpcd
	(b) Sewage Generation from (specify treated industrial effluent if any)	Nil
	(c) Net capacity of Sewage Treatment Plant required in IURWTS command	58.402 MLD
	(d) Net STP capacity required –	50.04 MLD. Elamkulam Sewer area =16.033 MLD (excluding KWA area)
3.5	Please furnish the major project components and component-wise estimated cost (Rs, in lakhs)	
	1. Sewage network	
	(a) Design period (30 years as per CPHEEO Manual)	30 years
	(b) Total length of road of Perandoor north catchment	138km
	(c) Total length of sewage network Perandoor north catchment	138 km
	(d) Total length of proposed line accounted for in the DPR (estimate)	138km Page 168 Section 10.2.1 Table 49 of DPR
	(e) Per capita sewage considered in the design (85% of water demand 150lpcd) 127.4 lpcd	Section III, Page 138-179

Consultant: 	DPR: Sewer network & Elamkulam 17.50 MLD	Project: IURWTS	Client: 
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(f) Ground water infiltration based on area/length of network/no. of manhole :	4500liters/sewer length /day
(g)Peak factor adopted (2 to 3) based on population as per Manual :	2.25 (since this is a part of Kochi Corporation with population 633553 in 2011)
(h) Pipe material of „n“ value (coefficient of roughness –	0.01 to 0.050) : (as per manual) (specify material) : 0.01
(i) Minimum velocity considered in the design	(0.3 m/s as per CPHEEO manual
(j) Maximum velocity considered in design	3m/sec Section III, Page 138-179
(k)Actual minimum velocity:	0.3m/s Section III, Page 138-179
(l)Actual maximum velocity:	2.25m/s Section III, Page 138-179
(m) Whether sewers have been designed to flow 0.8 (d/D) full at ultimate peak flow:	YES Section III, Page 138-179 For
(n) Actual d/D ratio:	0.75 Section III, Page 138-179
(o) Spacing between manholes (please specify size wise) (30m -300 m depend on size of sewers as per CPHEEO Manual) :	30m Section III, Page 138-179
(p) Depth of cutting (1m -6m asp per manual) :	1.06-4.5 for Corporation Section III, Page 138-179
(q) Minimum (Actual)	1.06 M Section III, Page 138-179
(r) Maximum (Actual):	4.5 m for Corporation and 5.5m for Kalamassery Municipality considering the site specific requirement and topography of the area Section III Pages 156-188
(s) Total no. of layouts (blocks) :	10 Nos.
(t) Total No. of nodes :	5022 Nos
(u) Total length of sewer network	135 km
(v) Proposed pipe sizes each block :	200mm – 630mm (trunk main)
(w) Peak flow from the outlet of trunk sewer as per the design	Trunk main – 28.21MLD
(x) Total peak flow of all the outfall sewers in all blocks and average flow	Section III, Page 138-179
(aa)Whether the average out flow from all the trunk sewer is matching the ultimate sewage generation of the project area (please specify)	Yes Section III, Page 138-179
2. Pumping Station and Pumping main/gravity main	8 No pumping station proposed and 2nos existing in IURWTS Project- Elamkulam STP
Pumping Station	
(a) Design period (30 years for civil structure and 15 years for electro-mechanical items as per CPHEEO Manual)	15 years
(b) Main pumping station (please specify nos. and capacity):	1 No.
(c) Types of pumping station based on dry well or wet well (please specify):	Wet well cum pumping station
(d) Types of pump, size of pumps, no. of pumps, capacity or flow rate of each pump, head of pumping, etc., (please specify):	Non-clog submersible pumps. Discharge 78.7LPS
(e) Standby for pump sets (Please specify 50% or 100%): 50%	50%

Consultant: 	DPR: Sewer network & Elamkulam 17.50 MLD	Project: IURWTS	Client: 
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	3. Pumping main	
	(a) No. of pumping mains & capacity:	In IURWTS project two pumping mains are proposed. Other pumping mains are under KWA
	(b) Design period (30 years as per CPHEEO Manual)	30 Years
	(c) Whether economic size of pumping main has been done using computer software and furnished.	yes
	(d) Pipe material used:	DI CL K9/HDPE PE 100 PN 10
	(e) "c" value adopted (as per Manual) :	140
	(f) Pumping hours considered (22 to 24 hrs) :	23 hrs
	(g) Pumping Head :	5
	(h) Pumping efficiency (60% to 80%)	70%
	4. Gravity Main	Trunk Main is proposed
	(a) No. of gravity mains and capacity:	Trunk mains for 2 blocks (direct to STP)
	(b) Size and length -	630mm, 4.285km
	(c) Material	HDPE PE 100 SN8
	(d) C Value adopted:	140
	(e) Available Hydraulic Head:	20
	Sewage Treatment Plant	
	(a) Design period (30 years as per CPHEEO Manual)	30 Years
	(b) Capacity of STP (proposed)	17.50 MLD Section III, Page 138-179
	(c) Proposed Technology:	Sequential Batch Reactor
	(d) Whether hydraulic design of STP has been done for design period of 30 years and furnished in DPR:	YES
	(e) Whether Life-cycle cost assessment of treatment technologies has been furnished in DPR	Appendix -1 of DPR
	(f) Whether temperature, elevation and location of the town has been taken into account while designing the process of the STP, Main pumping station wherever required and furnished in DPR :	YES
3.6	House service connection (sewers) proposed :	14651
3.7	Whether the proposed scheme envisages Supervisory Control and Data Acquisition (SCADA) arrangement :	yes
3.8	Whether modular approach has been adopted to facilitate "addition" units to SWTP at a future date, whenever required :	Yes
3.9	Whether computer Aided Design (both design & simulation) for Sewage Treatment Plant, pumping station, distribution network has been furnished in DPR	YES Computer based design in MS Excel
4.0	Whether the sewage characteristics of source have been tested by NBEL accredited laboratory and furnished in DPR	YES Annexure 2 of DPR
4.1	Whether treated sewage shall conform to the effluent standards notified by the respective SPCB/CPCB	YES Section III, Page 138-179
4.2	Whether surge analysis using computer software for pumping main has been done and furnished in the DPR	NA

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4.3	Whether Hydraulic Flow Diagram (HFD) with head loss calculation for STP and layout plan of STP with other components has been furnished in DPR	YES Computer based design in MS Excel Section III, Page 138-179
4.4	Whether maps of proposed sewer networks indicating RL, Node no, Link no, for all the zones (Project area) are enclosed with the DPR.	Section III, Page 138-179
4.5	Whether the provision of the land for land acquisition for the Sewage treatment plant, pumping stations/mains, sewer network, if any, has been made as per 30 years requirement and future expansion in the DPR :	YES Section III, Page 138-179
	(a) Total requirement of land for: STP	1.86 Ha
	Laying of Pumping Stations, pumping mains and primary lines-	0.081 Ha for pumping station and well 2 Nos
	(b)Whether land in possession with Implementing Agency:	The STP is proposed as upgradation of Existing STP owned by KWA. Hence land not required for STP. Land of one well at Kaloor is also available with KWA. Land required for Well at Thevara 0.04 Ha and land for Well near Kottaikanal bridge Kathrakkadavu is .0405Ha
	(c)Whether Govt. land is yet to be transferred to the Implementing Agency and specify time required for transfer	6 months
	(d) Whether private land under acquisition and time required for acquisition:	0.081 Ha. / 6 Months
	(e) Status of action initiated for transfer of Govt. land and acquisition of private land (please specify) :	Revenue AS received from GoK and LA in process
4.6	Whether Bill of Qualities (BOQ) and cost estimates of individual components of sewerage system prepared as per latest SOR of KIIFB and copy of latest Schedule of Rates (SOR) and Pro-forma invoices have been annexed with DPR :	Yes. Annexure 5 of DPR
	(a) Schedule of Rates adopted (please specify the year) :	PRICE 2018
	(b) In case the SOR adopted is old, please specify the cost index:	Yes 35.59%
	(c) Any price escalation proposed in cost estimates (no price escalation shall be included in the DPR):	NA
	(d) Whether analysis of rate has been worked out for all the items and appended with DPR	
	(e) Whether Bill of Quantities of individual component has been furnished in DPR :	Yes Annexure 5 of DPR
	(f) Whether lumpsum provision for any item has been proposed, please specify :	Yes Annexure 5 of DPR
4.7	Whether detailed drawing, estimation & detailed BOQ for ancillary works such as boundary wall / fencing, approach & internal road, external electrification, buildings, water supply & drainage, site development /landscaping etc. has been provided in the DPR :	Yes Annexure 5 of DPR
4.8	Whether provision for road restoration, if any has been made as per CPWD/ State PWD/ Urban Local Body norms	Yes Annexure 5 of DPR



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4.9	Whether detailed PERT/CPM network showing implementation schedule has been furnished in DPR	yes
5.0	Whether Internal Rate of Return (IRR) / Economic Rate of Return (ERR) has been furnished in DPR:	Yes for Whole project Section 10.5.1 Page 188 of DPR
5.1	Whether traffic diversion/ control management for public and workers" safety, arising out of construction phase of sewerage works have been furnished in the DPR:	Yes Section 11 of DPR
5.2	Whether Institutional and financial status of Project Executing Agency (PEA) has been reported in DPR	Yes Page 1 /Section 1.1 of DPR
5.3	Whether project implementation period of project has been furnished in DPR Specify the implementation period:	24 months Section 9 Page 189 of DPR
5.4	Whether Environmental and social problem (if applicable) has been furnished in DPR	yes
5.5	Whether Rehabilitation and Resettlement plan (if applicable) has been given in DPR :	NA
5.6	Whether all the hard copies of the DPR furnished along with soft copies:	yes
5.7	Period of completion of the project :	138 months including O&M of 10 years



SECTION – I

GENERAL FEATURES OF IURWTS CATCHMENT

Consultant:  anteagroup	DPR: Sewer network & Elamkulam 17.50 MLD	Project: IURWTS	Client: 
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1. Introduction

1.1 Background

It is found that about 95 percent of sewage and sullage discharged by the individual households in the catchment are let into the existing drains and canals of the catchment. The prime aim of the project is to rejuvenate and maintain the five canals of Kochi city and enabling navigation through these canals for mile to mile connectivity. The reinstated canals shall be maintained as such, free of contamination up to maximum and is possible only after implementation of an effective sewerage scheme for the catchment area.

The sewer network planned is such that the sewage waste is properly collected, transported, and treated in sewage treatment plant. The output after treatment will adhere to the regulatory effluent standards and disposed in such a way that it will not cause health and environmental related issues to the inhabitants of the catchment.



Under AMRUT and JNNURM, many sewer networks and STPs were envisaged in Kerala but the schemes did not take off in Kerala and the implementation was rated poor. Kochi corporation also tendered a 5MLD STP (2018) under AMRUT at Elamkulam without network facilities, and the work is nearing completion.

The sanitation facilities provided through cent percent sewer network connectivity to the house holds of IURWTS catchment is in conformity with the sanitation policy in India. The improved facilities will be a key to achieving improved public health and enhanced socio-economic outcomes.

1.2 Regulatory and legal Framework

Government of India as well as States and ULBs bring out regulations in the sector from time to time. The regulations relevant to sewage management are as below. (i) Central Laws include the Environment (Protection) Act, 1986, the Water (Prevention and Control of Pollution) Act, 1974, Notifications of MoEF&CC and the Municipal Laws from time to time, which provide a framework for control of effluent, sewage and septage discharge.

Govt. of India EIA notification of 2006 (replacing the EIA notification of 1994) sets out the requirement for Environmental Assessment in India. This states that Environmental clearance is required for Specified activities/projects, and this must be obtained before any construction of work or land

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preparation (except land acquisition) may commence. Projects are categorized as A or B depending on the scale of the project and nature of its impact.

Category A projects requires environmental clearance from central Ministry of Environment, Forest, and Climate Change (MoEF&CC). The IURWTS Catchment development comes under Category A and hence the Employer based on the preliminary details required to be provided submitted the same to MOEF &CC and the Expert Appraisal Committee (EAC) approved the Terms of Reference (ToR) for the EIA Study. The project has got approval of environmental clearance from MoEF&CC on March 2021.



1.2.1 Other Legislations applicable to Construction Project

The provisions of the Bureau of Indian Standards (BIS) (IS:2470) as applicable for Septic tanks, soak pits, cess pools, leach pits, drainage fields etc. are also relevant while strengthening on-site sanitation system.

The Government has also laid down standard e.g., IS 11972 – 2002: Code of Practice for Safety Precautions to Be Taken When Entering a Sewerage System. This standard lays down guidelines for selection of sewer-person and safety measures against gas hazard, infection with a view to provide some basic guidance for selection of employees for sewer cleaning and proper job instructions for safe working in a sewerage system. The treated sewage effluent discharge standards published by (MoEF&CC) is given in **Table 1**.

Table 1: Treated sewage effluent discharge standards by MOEF &CC

SL. No.	Parameters	General norms 1986				MoEF&CC Notification, October 2017**	NGT order 2019** (for Mega and metropolitan cities)
		Inland Surface water	Public sewers	Land irrigation	Land coastal areas		
1.	BOD [mg/L]	30	350	100	100	<30 <20(metro cities)	<10
2.	COD [mg/L]	250	–	–	250	Not more than 50 (for new STP design)	<50
3.	TSS [mg/L]	100	600	200	100 process water 10% of influent cooling water	<100 <50(metro cities)	<20

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SL. No.	Parameters	General norms 1986				MoEF&CC Notification, October 2017**	NGT order 2019** (for Mega and metropolitan cities)
		Inland Surface water	Public sewers	Land irrigation	Land coastal areas		
4.	TKN [mg/L]	100	—	—	100	Not more than 10 (for new STP design)	<10
5.	NH3-N [mg/L]	50	50	-	50	Not more than 5 (for new STP design)	-
6.	Dissolved phosphorus [mg/L]	5	-	-	-	-	<1
7.	Faecal coliform [MPN/100ml]	-	-	-	-	<1000	Permissible <230

Source: NGT 2019, MoEF&CC 1986, 2015 and 2017 & CSE report on Performance study of FSTPs in India 2020

2. Review of Sanitation Sector in Kochi and IURWTS Project Command

Kerala water Authority is a state level agency which is operating the 4.45 MLD Elamkulam plant in IURWTS catchment and is responsible for sanitation services inside the catchment.

Greater Cochin Development Authority (GCDA) is the planning and development Authority of the Metropolitan area of Kochi. One STP plant of 0.9MLD is at present being operated by GCDA in Marine drive area.

The premises or properties of individuals that are not served by piped sewer systems adopt onsite sewage treatment systems in IURWTS catchment. The on-site sewage treatment systems treat sewage within the premises of its generation and are also termed as non-sewered sanitation. Conventional Septic tank with soaking options Septic tank combined with soak pit is the most common type of on-site sewage treatment system that is currently practiced in IURWTS catchment in non-sewered areas.

Hence for a proper coordination of KWA, GCDA, and Corporation a Special Purpose Vehicle (SPV) has been proposed for proper operation and maintenance of IURWTS STP and sewer network components.

The details of covered area under IURWTS Project is as given in the **Table 2** and **Figure 2**.



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Table 2: IURWTS Sewer Area

Corporation/Municipality	Covered Area in Sq. km
Kochi Corporation	31.07
Kalamassery Municipality	5.418
Thrikkakkara Municipality	6.797
Thripunithura Municipality	0.65

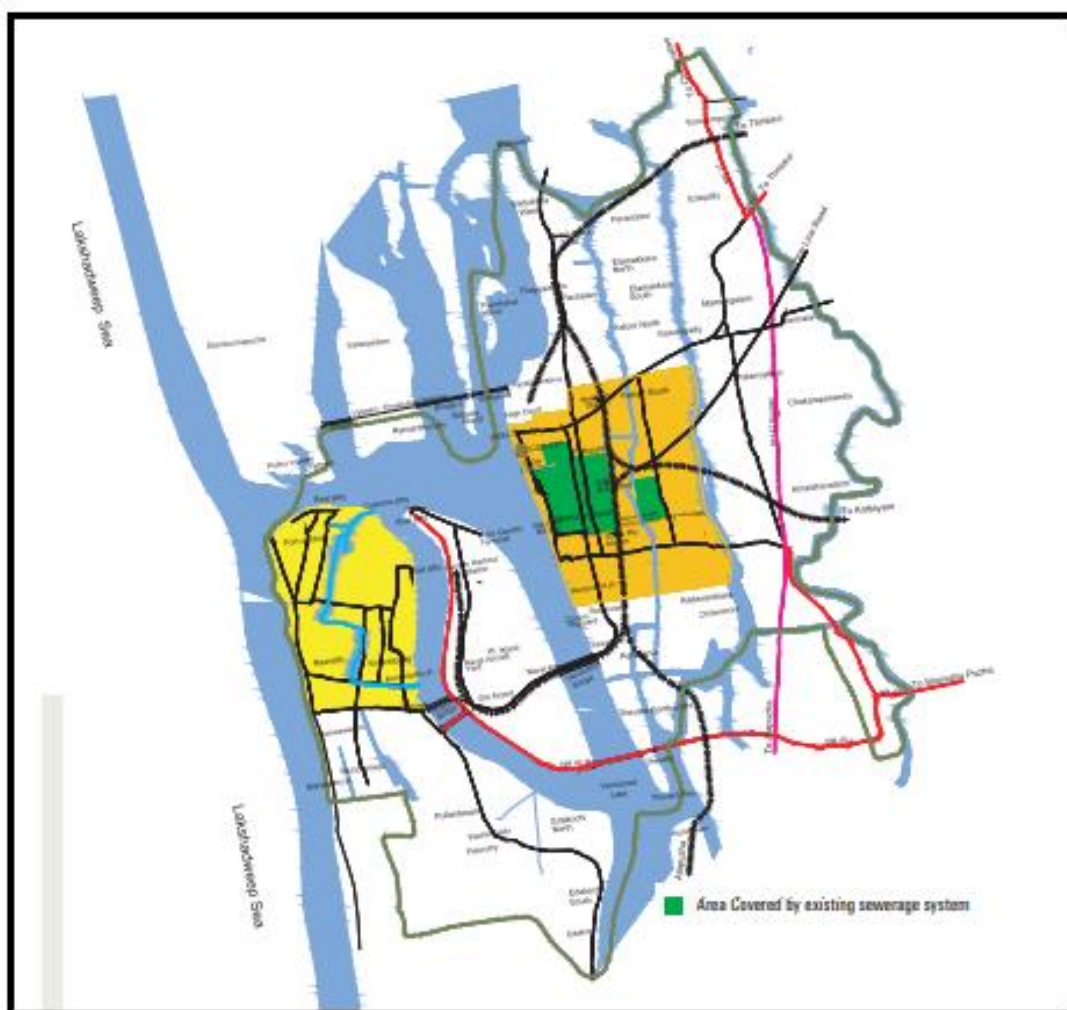


Figure 2: Area covered by sewer network in IURWTS catchment

Kochi city is one of the fastest growing economies among Indian cities and this pace of growth is likely to continue in coming decades. The IURWTS catchment occupies one third of the area of Kochi corporation including area coming under 3 municipality (Kalamassery, Thrikkakkara and Thripunithura).

Consultant:



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IURWTS

Client:



Census data 2011 indicates the total urban population Kochi corporation is 633553 Nos. and the 3 municipalities together is 240907 nos. The population census data from (1971-2011) for Kochi corporation and the adjoining municipalities forming part of IURWTS catchment is as given in **Table 3**.

The projected population for the year 2055 for Kochi corporation is 8,26,928 Nos and the 3 municipalities together work out to 3,42,493 nos. The fast pace of urbanization –primarily due to quest of good quality education, healthcare facilities, job opportunities, rapid changes in lifestyle and growing aspirations–coupled with spurt in economic activities has compounded the public health issues in Kochi. To address the challenges, adoption of both short term and long-term solutions with due leveraging of technology, is need of hour.



Table 3: Population census

Corporation/ Municipality	Area (Sq. Km)	Population Census					Density/Sq. Km
		1971	1981	1991	2001	2011	
Kochi Corporation	94.88	439066	513249	564589	595575	633553	6775
Kalamassery Municipality	27.00	29546	43767	54342	63116	71038	3015
Thrikkakkara Municipality	28.01	26862	38318	51166	65984	77319	3121
Thripunithura municipality	29.17	49884	59163	69490	81397	92550	3465

2.1 Sanitation issues in IURWTS Catchment

The ultimate aim of the IURWTS project is to ensure cent percent sewer network to the household and make the catchment an open defecation free zone. For individual or group of households who have constraints of space, tenure, or economic constraints in gaining access to sewer network and cent percent upkeep and management of public sanitation facilities will be assured with community planned and managed toilets. Provision for the same has been included as part of the IURWTS project DPR.

The urban poor (Below Poverty line) population in IURWTS catchment was assessed based on SIA studies undertaken by the General consultant. There are reported 3 slums in the AOI of the canal corridor. Stakeholder analysis was conducted to find out key stakeholders and their interest and involvement in the proposed sanitation improvement process. After the secondary data collection, social Impact Assessment team developed a questionnaire for social survey and visited all likely impacted households (both title and non-title holders) and gathered their perception on the project, family details, Socio-

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Economic details, and suggestions to improve the project objectives. Apart from this SIA team has conducted discussion and consultation with Local Body Representatives and local public and recorded their suggestions and opinion. The study team also did transit walk and observation visit to crosscheck the suggestions and grievance which were recorded. The study team reviewed the relevant and available documents (land records and socio-economic data) in Kochi Corporation, Greater Cochin Development Authority, and different municipalities. SIA team conducted one to one discussions and consultations with all Title Holder families. A snap shot from the survey is given in **Figure 3**.



Figure 3: Snap shots of the household survey

Source: Household survey, KVHS- June 2020

Elamkulam STP, which was constructed in the year 1971 with an original capacity of 4.45MLD, is currently treating only 3 MLD sewage due to reduced efficiency of the plant (Source: KWA) **Figure 4**. The underutilization is attributed to limited connections to the KWAs Sewerage networks. At present there are only 1184 connections covering including general hospital, St. Teresa's college and buildings in M.G Road vicinity as informed by KWA sources. At present the Elamkulam plant does not have the facility to receive waste from septic tank cleaning vehicles. The technology for treatment of sewage is activated sludge Treatment process (ASP) and the effluent discharge is discharged into Chettichira lake nearby. The STP plant requires urgent modernization and upgradation.



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Figure 4: KWA's Sewage treatment plant at Elamkulam running

3. Sanitation Proposal for IURWTS catchment



Many proposals for STP works that Kochi Municipal Corporation (KMC) had taken up earlier failed due to protest from the public of the locality. This was mainly because the locations proposed for construction of STP's in the vicinity of highly urbanized colonies. Hence before the DPR preparation of IURWTS commenced the first initiative taken by KMRL (SPV) and General consultant Antea group, Nederland was to organize stake holder meetings.

During stakeholder and NGO meetings held in December 2019 and January 2020 organized by the Client the following demands were raised:

1. Identify STP site location that are not in the middle of an urbanized colony area.
2. Improve the sewage treatment facility for the entire IURWTS catchment rather than limiting the area of interest in and around the main canals only.
3. Provide sanitation facilities for the those not connected with sewer networks.

As an output of various discussions and meetings with various stake holders and public, and final concurrence from Kerala state pollution Control Board, 4 STP sites are identified in IURWTS catchment. Vennala and Elamkulam on the Southern tail end and Muttar and Perandoor at the northern tail end of IURWTS catchment.

The 3 major canals and their catchments are delineated. The catchment area of Thevara canal falls inside Thevara-Perandoor and hence it is treated as a single catchment for calculation of sewer loads generated. The catchment map is overlaid with the wards map and the individual catchment is clipped to assess the population contributing to the respective canals. The present proposal is to have 4 STP's.

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The NH-544 forms a ridge line cutting the catchment in the east-west direction. The wards falling on the southern side and the northern side catchments of the 3 canals (Thevara-Perandoor (combined), Chilavannoor, and Edappally) was segregated. The flow direction based on the ground topography is as given in **Figure 5**.

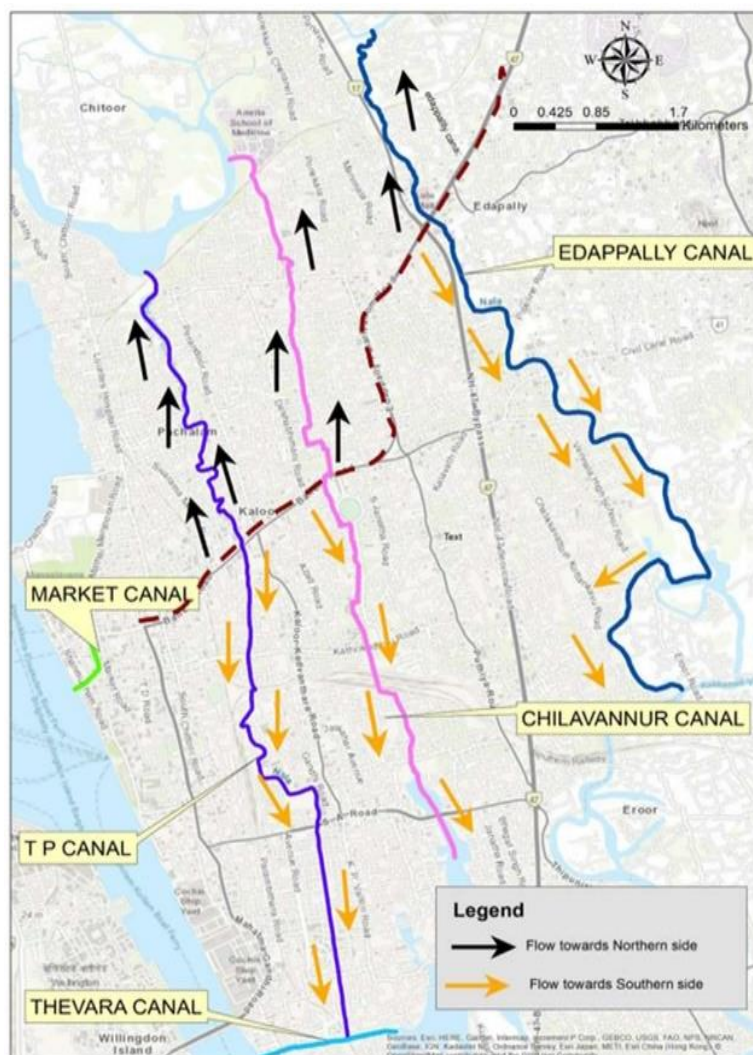




Figure 5: Flow direction based on topography

An integrated approach has been taken while studying and designing the new proposal. The sewage collection system of various sewerage Zones have been identified based on topography, physical boundary and 100% household connectivity by sewer connection & adoptability of stakeholders.

Underground Sewerage Scheme is proposed to be covered by de-centralized sewerage system considering the topography of the IURWTS catchment by way of dividing it into six sewerage zones. Four

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STP sites identified for the 6 zones with decentralised STPs at Elamkulam and Vennala at Southern side catchments and Muttar and Perandoor on the northern side catchment.

All the sites proposed were at the tails ends of the catchment areas of the canals. Two STPs on the northern side of the NH 544 proposed are at Perandoor (4MLD) and at Muttar (7MLD) and two on the southern side at Elamkulam (10MLD) and Vennala (10MLD) and location detail is given in **Figure 6**.



Figure 6: Location sketch of 4 STPs in IURWTS Catchment

All the STPs are proposed at the tail end of the canals at the outer limit of the urban fabric and adjacent to water bodies so that minimum environment disturbance is caused. The site selected is such that no inhabitants live within a radius of 50m from the STP location. The STP sites are at the tail ends of the canals which are the least urbanized except Elamkulam.

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At Elamkulam, the existing 4.45MLD STP is proposed for upgradation to a 10MLD plant. The area requirement for the STPs is as given in **Table 4**.

Table 4: Location of STPs with Area details

Sl. No	Location/Capacity	STP Area (in Ha)	Acquisition Area (in Ha)
1	STP at Vennala-10MLD	0.50	1.64
2	STP at Muttar -7MLD	0.48	1.23
3	STP at Elamkulam -10MLD	0.50	1.86
4	STP at Perandoor- 4MLD	0.40	0.40

The catchment areas of project canals is divided into 6 zones for implementation of the scheme and to avoid distant transportation of sewage and reduce the energy expenses.

Table 5 and **Figure 7** shows the zoning of IURWTS Catchment.

Table 5: Different Zones of IURWTS catchment

Zone 1	Catchment area of Edappally Canal on southern side of NH544 from near Lulu mall up to Chithrappuzha River.	15.14 Sq. Km
Zone 2	Catchment area of Edappally canal towards northern side of NH 544 from Edappally Lulu mall to Muttar puzha	4.00 Sq.Km
Zone3	Catchment area of Chilavanoor Canal in the northern side of NH 544 from Edappally up to Elamakkara.	4.92 Sq.Km
Zone 4	Catchment area of Chilavanoor canal in the southern side of NH 544 up to Elamkulam.	8.67 Sq. Km
Zone 5	Catchment area of Thevara Perandoor Canal northern side from NH 544 up to Perandoor near Perandoor School	4.07 Sq. Km
Zone 6	Catchment area of Thevara Perandoor canal southern side from NH 544 up to Thevara and Catchment area of Thevara Canal	5.355 Sq. Km

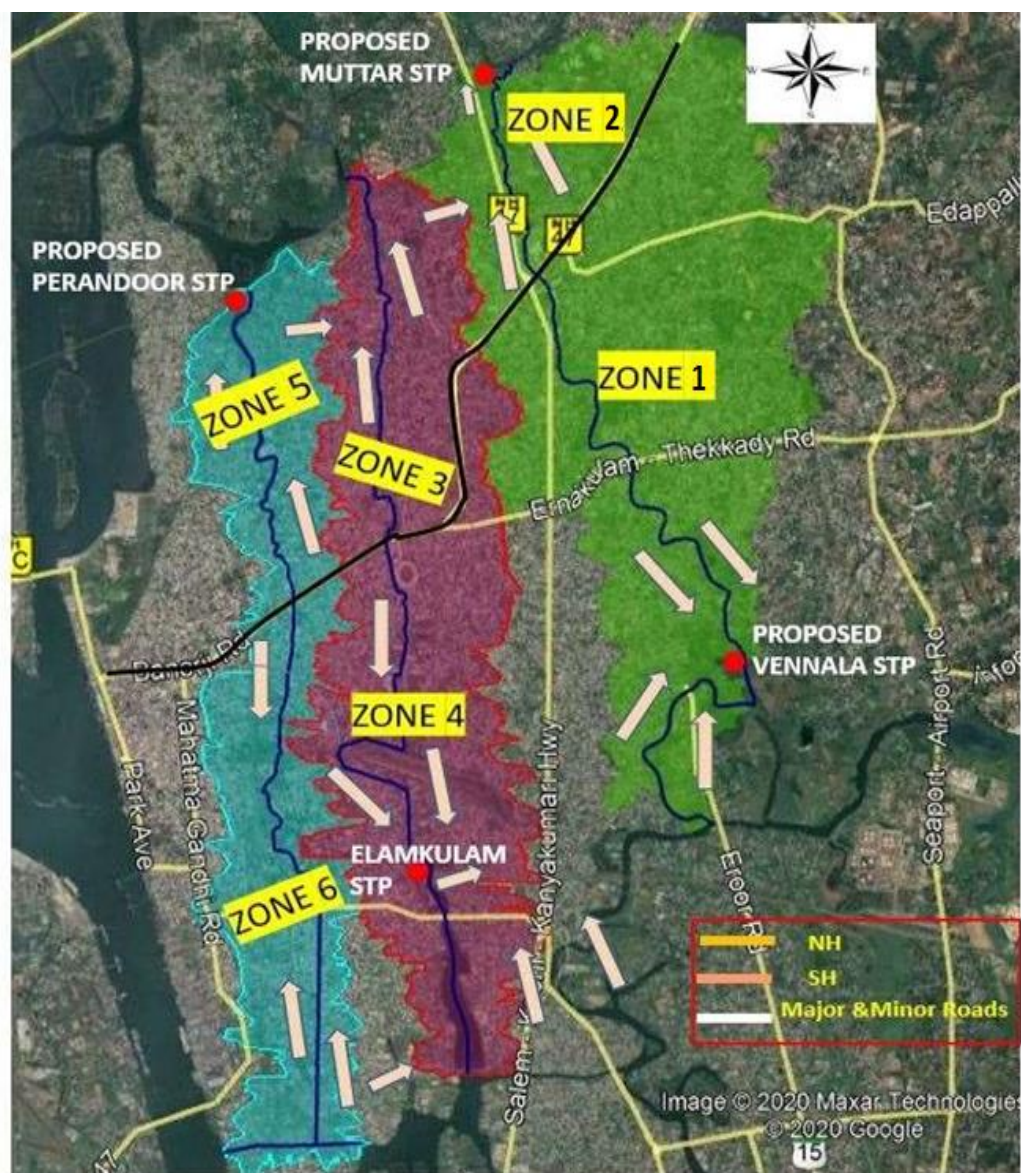




Figure 7: Zoning of IURWTS catchment area

General Methodology

- 1) Held discussions with concerned Stake holders, NGOs, Public representatives, Senior citizens, Retired stake holder of various departments and undertook site visits to get a holistic picture of the IURWTS catchment.
- 2) Obtained Secondary information about Kochi city and municipal areas in general and collected specific data of IURWTS catchment related to, such as area, population, rainfall, climatic conditions, existing water supply facilities, present water supply through them in different seasons, ward wise information etc.
- 3) Obtained various maps related to the IURWTS catchment area and topographical maps

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- 4) Worked out population projection of IURWTS catchment by adhering to the [procedures contemplated as per Manual of CPHEEO and finalized realistic figures.
- 5) Worked out sewage load to be collected from different zones delineated and ideal location of sewage treatment plants adhering to the Environmental norms.
- 6) Collected characteristic of the sewage to be treated and identified the Techno-economical solution for the treatment technology to be adopted.
- 7) Carried out detailed survey including taking levels all along the roads not available in the secondary data collected, fixing benchmarks, fixing location of STP, Sump & Pump house etc.
- 8) Designed various components from the scheme as per guidelines given in the manual on Sewerage and Sewage Treatment by CPHEEO, New Delhi / NRCP Guidelines.
- 9) Prepared detailed estimates of the project based on 2018 PRICE schedule with cost index and prepared rate analysis for items.

3.1 Present scenario of IURWTS Project command sewerage system

Detailed Engineering Reports for individual STP and sewer network for the covered area were prepared and submitted to KMRL for a total amount of INR 836.976 Crores which were then forwarded to the vetting agency M/s. CUBE-IIT before submission to KIIFB for approval.

After several discussions, meetings with the vetting agency and KWA, the nodal agency for Sewerage schemes in Kerala all the sewerage schemes were redesigned after the optimization of zones in the individual sewer zones.

The population projection and sewer load calculation were revised according to the KWA MASTER PLAN for Kochi city and adjoining municipalities (Kochi Urban agglomeration) and the population and sewer load of the IURWTS catchment areas were computed up to a projected year of 2055 and is attached as **Annexure I.**

The sewer loads in the left-out portions of IURWTS project were proposed to be under KWA and were designed for collecting and conveying to Perandoor/Muttar STPs based on the location and topography. The zone wise sewer load calculation and the STP details for IURWTS Project area is as given in **Table 6.**

The said loads are taken in the sewer design and treatment capacity of STPs. In Perandoor STP covered area there was no such left out portions.





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Table 6: Sewer load estimation for IURWTS catchment

STP and Catchment	Sewerage Flow					TOTAL MLD (2055)	Proposed sewer load (REVISED) (IURWTS) MLD
	Sewage (2021) in MLD	Sewage (2025) in MLD	Sewage (2040) in MLD	Sewage (2055) in MLD			
	KMRL				KWA		
Zone 1_Vennala STP catchment	14.818	15.025	16.905	18.742	4.70	23.442	24.00
Zone 2&Zone 3_Muttar STP catchment	11.679	11.929	12.924	14.035	1.48	15.515	
From Perandoor to Muttar				0.62		0.62	
						16.14	16.50
Zone 5_Perandoor STP catchment	7.78	7.94	8.56	9.24	0.62	9.87	
To Perandoor						9.24	
From Vaduthala Zone of KWA					9.30	9.30	
To Muttar						0.62(-)	
						18.54	19.00
Zone 4& Zone 6_ElamkulamSTP catchment	13.51	13.78	14.85	16.03	24.93	40.96	KWA STPs- 17.5 MLD , 15MLD, and 10 MLD at Elamkulam
				58.05			
TOTAL						99.08	102.00



This DPR is prepared for sewerage system for Elamkulam zone under IURWTS Project with a generated sewer load of 16.03 MLD (consists of TP canal and Chilavanoor canals south catchments) and 17.50 MLD STP at Elamkulam, the existing STP site owned by KWA. Separate sections for Sewage Treatment Plant and Sewer networks are added in this DPR along with a brief description of the various advanced technologies, advantages, and disadvantages of Secondary treatment of STP, Technology recommendation for IURWTS project, Sewer network designs in line with the recommendations from M/s. CUBE-IIT and KWA officials.

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SECTION – II

SEWAGE TREATMENT PLANT

17.5 MLD SBR AT ELAMKULAM

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4. Sewage treatment and Selection of appropriate technology

4.1 General

The objective of wastewater treatment is to remove pollutants from waste and to bring the quality of effluent to the desired standard. It is necessary to know the characteristics of raw sewage water, its mode of use or disposal of effluent to determine the degree of treatment required. Different types of treatments provide different percentage removal of BOD and suspended solids. In general treatments are classified as primary, secondary, and tertiary. The general yardstick for evaluating the performance of sewage treatment is the degree of reduction in BOD, COD, Suspended solids etc.




Sewage treatment Plants are classified as ASP, SBR, MBBR etc base on the secondary or biological treatment technology

4.2 Primary Treatment

Any material that can enter the sewer lines through the sanitary system in the homes or through manholes on the sewer line or in any other manner will be delivered to the treatment plant. Such materials may include refuse of every type of garbage, rags, pieces of wood cans and children toys and other playthings. These materials would injure subsequent equipment, clog piping, or wrap around pump impellers and interfere with treatment process. The object of the provision of primary treatment is to provide protection to the subsequent treatment units and to enhance the efficiency of the treatment processes.

Primary treatment consists of temporarily holding the sewage in a quiescent basin where heavy solids can settle to the bottom while oil, grease, and lighter solids float to the surface. The settled and floating materials are removed, and the remaining liquid may be discharged or subjected to secondary treatment. All sewage treatment plants should follow a process chain depending upon the technology chosen and the treatment capacity. In general, treatment is to be done in three stages. Specifications and treatment objectives at each stage of treatment are as follows. The preliminary treatment follows:

- a) Three Stage Screening
 - 25 mm bar racks (before pumping) - Coarse screen channel
 - 12 mm bar racks -fine screen channel
 - 5 mm mesh (< 2 mm mesh to grit chamber

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- b) Aerated Grit Chamber if following unit operation is aerobic and Normal Grit Chamber if following unit operation is anaerobic.



Primary treatment is actually the pre-treatment which consists of separation floating and suspended organic and inorganic matters by physical process such as screening by which materials larger in sizes than the opening of the screening device is strained out and grit removal by which coarse particles of ash and other materials which have subsidence velocities substantially greater than those of organic putrescible solids are removed.

Screening is an essential step in sewage treatment for removal of materials which otherwise damage equipment, interfere with the satisfactory operation of treatment units or equipment. Screens is the first step in all treatment works.

A screen is a device with openings generally of uniform size for removing bigger suspended or floating matter in sewage. The screening element may consists of parallel bars, rods gratings or wire meshes, and the opening may be circular or rectangular shapes.

Coarse Screens are the bar screens comprised of vertical or inclined bars at equal intervals across a channel through which sewage flows. The size of the openings ranges from 75mm to 150mm. Medium bar screens have clear openings of 20mm to 50mm. Bars are usually 10mm thick and are rectangular or circular section. A weir on the side of the screen may be used as an overflow bypass. Fine screens are mechanically cleaned devices using perforated plates, woven wire cloth or very closely spaced bars with clear openings of less than 20mm. Grit removal is necessary to protect the moving mechanical equipment. Grit chambers are of two types. Mechanically cleaned and manually cleaned. Scrap blades or ploughs rotated by a motor drive. The grit washing mechanisms are also of several designs most of which are basically agitation devices using either water or air to produce washing action. The grit chambers must have sufficient storage capacity. A detention period of 60seconds is usually adopted.

Expected effluent quality after preliminary treatment: Primary sewage treatment removes 40%-60% of suspended solids and about 30% of organic matter. The quality of effluent is expected such that no floating materials including polythene bags, small pouches, etc. present in the sewage flow.

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4.3 Secondary Treatment (Biological Treatment)

Secondary treatment is designed to substantially degrade the biological content of the sewage such as are derived from human waste, food waste, soaps, and detergent. Most municipal and industrial plants treat the settled sewage liquor using aerobic biological processes. For this to be effective, the biota requires both oxygen and a substrate on which it live. Process is depicted in **Figure 8**.

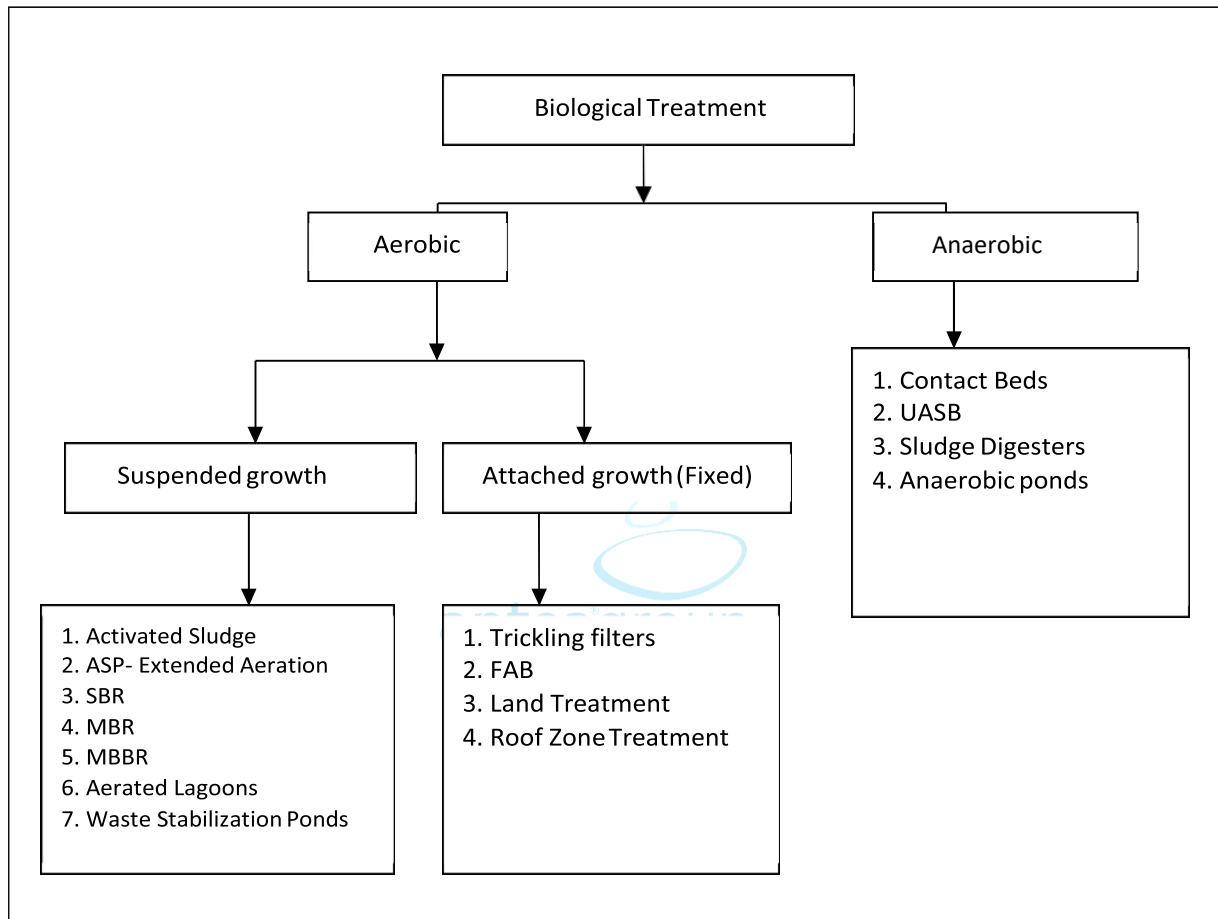


Figure 8: Biological treatment processes

There are several treatment systems that have been applied for sewage treatment and have their own merits and demerits. The strategy for wastewater treatment is to provide low-cost treatment with a robust process that considers local conditions. The overall objectives of biological treatment of sewage water are to transform or oxidise dissolved and particulate biodegradable constituents into acceptable end products and bind much of the less soluble fractions into flocs and to transform or remove nutrients such as nitrogen and phosphorus.

To select the feasible alternatives, the process requirements must be known. Apart from construction and running costs, factors that need to be considered in selecting appropriate processes include Effluent quality, Process complexity, Process reliability, Land requirements, Energy requirements, Sludge handling, Effluent Reuse.

The principal biological process for sewage treatment can be divided into two main categories; suspended growth and attached growth processes.

4.3.1 Suspended growth process



In suspended growth process the microorganisms responsible for treatment is maintained in liquid suspension by approximate mixing methods. Examples of suspended growth processes are: Activated sludge and its modification, Aerobic and anaerobic digesters, Up flow anaerobic sludge blanket (UASB Unit), Aerated Lagoon, Waste stabilization ponds etc. The most common suspended growth process used for wastewater treatment is activated sludge process.

The various treatment options considered to find out the techno-economically best suitable treatment scheme to suit wastewater and effluent characteristics, climate, and land constraints for the STPs in IURWTS project are as follows.

- i. Up flow Anaerobic sludge Blanket (UASB) reactor
- ii. Conventional Activated Sludge Process
- iii. ASP with extended aeration
- iv. Sequential Batch Reactor (SBR)
- v. MBBR
- vi. MBR/ FAB

4.3.1.1 Up flow Anaerobic sludge Blanket (UASB)

The development of the up flow Anaerobic sludge Blanket (UASB) reactor dates back from early 1970's Pre-sedimentation, anaerobic wastewater treatment and final sedimentation including sludge stabilization are essentially combined in one reactor making it most attractive high-rate wastewater treatment option. In the Up-flow Anaerobic Sludge Blanket (UASB) process, the wastewater to be treated is introduced at the bottom of the reactor. The wastewater flows upward through a sludge blanket composed of biologically formed granules or particles. Treatment occurs as the wastewater comes into contact with the granules.

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UASB initially was developed for the anaerobic treatment of industrial wastewater with a moderate to high COD and BOD concentrations. The basic idea is flocculent or granular sludge developed in the reactor depending on the wastewater characteristics and operational parameters will tend to settle under gravity when applying moderate upward velocities in the reactor. In this way no separate sedimentation basin is necessary. Anaerobic bacteria are developed in the reactor and are kept in the biological reaction compartment for sufficient time. Organic compounds present in the wastewater are absorbed or adsorbed on the sludge particles in the reaction zone during its passage through the sludge bed. Organic compounds there after getting anaerobically biodegraded converting it into methane- enriched biogas and a small part into the new bacterial mass.

The BOD and SS requirements will not be met, and Additional treatment is necessary for UASB. The UASB/ FPU system is a 2-stage system in which the main degradation processes take place in the UASB system. The polishing of the UASB effluent takes place in the Final Polishing Unit (FPU), which has a hydraulic retention time of 1 day. The anaerobically stabilized sludge is dried and transported offside. The gas is used for energy recovery by dual fuel engines. The excess gas is flared.

4.3.1.2 Conventional Activated Sludge Process

The conventional Activated Sludge Process (ASP) for sewage treatment is widely applied in India and abroad. The process basically involves the aeration of settled sewage – mixed with return activated sludge in an aeration tank, the air being introduced into the liquid by either surface aerators or a diffused air system. The biomass generated in the aeration process is normally flocculent and settles out relatively easily, in secondary sedimentation tanks. The majority of this secondary, or activated, sludge is recovered to the aeration tank. The principal units required after screening include primary settlement tanks, aeration tanks, secondary settlement tanks and a pumping station for returned sludge and given in **Figure 9**.

The mechanism of the process is that the raw (or generally after primary treatment i.e., Screening, grit removal) sewage is separated in the aeration tank for few hours in which the microorganisms metabolize the soluble and suspended organic matter. Part of the organic matter is synthesized into new cells and part is oxidized into Carbon dioxide and water to derive energy. In the activated sludge system, the new cells formed in the reaction are removed from the liquid stream in the form of flocculent sludge in settling tanks. A part of this activated sludge is recycled to the aeration basin and the remaining forms the waste or excess sludge. The process is named activated sludge because

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it involves the production of an activated mass capable of aerobic stabilization of organic material in wastewater.

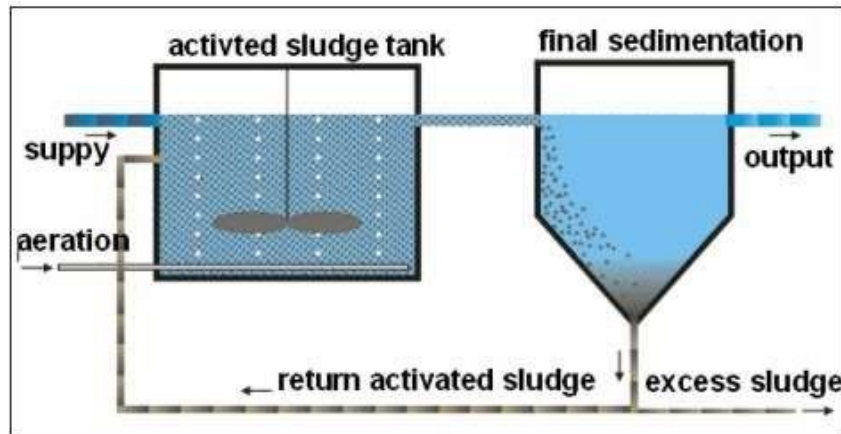




Figure 9: Flow diagram of Conventional activated sludge process

The suspended solid concentration in the aeration liquor, also known as mixed liquor suspension solids (MLSS), is generally taken as an index of mass of active microorganism in aeration tank. However, the MLSS will contain not only active microorganisms but also dead cells as well as inert organic and inorganic matter derived from the influent sewage. The mixed liquor Volatile Suspended solids (MLVSS) is also used and is preferable to MLSS as it eliminates the effect of organic matter. The aerobic and facultative bacteria are the predominant microorganisms which carry out the reactions of organic matter that is oxidation and synthesis.

The basic activated sludge treatment process consists of the three following basic components.

- A reactor in which the microorganisms responsible for treatment are kept in suspension and aerated.
- Liquid solid separation generally in sedimentation tank.
- A recycle system for returning the solids from liquid solid separation unit back to the reactor.

An important feature of activated sludge process is the formation of flocculent settleable solids that can be removed by the gravity settling in sedimentation tanks. In most cases activated sludge process is used in conjunction with physical processes that are used for primary treatment of wastewater, including the disinfection and possibly filtration.

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There are two types of mixing regime in aeration tank. When sewage moves down progressively along the aeration tank and remains unmixed with the rest of the contents of the tanks, it is called plug flow. When there is disposal of incoming sewage flow in the tank in which complete mix takes place, it is termed as complete mix activated sludge (CMAS). Understandably in case of plug flow system, F/M and the Oxygen demand will be highest near the inlet of the tank, which then reduces gradually. In case of complete mix flow system F/M and Oxygen demand would remain uniform throughout.

Conventional system of treatment of sewage represents the methods adopted during early development of activated sludge process. The conventional system is always preceded by primary settling tanks. The plant itself consists of an aeration tank, a secondary settling tank, as sludge return line and an excess waste line leading to a digester.



In the conventional activated sludge process, sewage is mixed with sludge separated from previously aerated sewage sludge mixture. It is then aerated and settled. Part of the settled sludge is returned to the aerating tank, the excess sludge, not returned is wasted, The BOD removal in the process is 85 to 92 %. The plant employs a plug flow regime which is achieved by a long and narrow configuration of the aeration tank with length equal to five times the width.

The requirement of air in conventional system is high and there is slack of operational stability when there is variation in flow. Still for historical reasons, conventional treatment system is most widely used type of activated sludge process in the world over and so in our country also, particularly in case of large plants.

The activated sludge process produces a large quantity of unstable sludge that requires additional treatment before disposal. The most common method of sludge treatment for plants of more than 50,000p.e. is anaerobic sludge digestion. The methane gas produced during digestion is a potential source of energy.

4.3.1.3 Activated Sludge Process with extended aeration

The extended aeration system is modification of the conventional activated sludge process. The activated sludge plant with extended aeration employs a complete mix flow regime and the primary settling tank is omitted. The process employs low organic loading, long aeration time, high MLSS concentration and low F/M. The BOD removal efficiency is high up to 95 %. Due to long retention

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in aeration tank, the mixed liquor undergo considerable endogenous respiration and get well stabilised. The excess sludge does not require separate digestion and can be directly disposed of after dewatering. Also sludge production is a minimum.

The Oxygen requirement for the process is higher and the running cost is also therefore high. Filtration and sterilisation is required to meet the effluent standards for hygienic quality. However the operation is simple due to elimination of primary settling and separate sludge digestion. This method is suitable for medium and large cities.



The above 3 technologies (Activated Sludge Process (ASP), Waste Stabilization Pond (WSP), Up flow anaerobic Sludge Blanket (UASB) Reactor), were the earlier technologies used for sewage treatment plants.

Over the last two decades, a few newer treatment technologies have come into practice. The innovative technologies include Sequencing Batch Reactor (SBR), Moving Bed Biofilm Reactor (MBBR)/ Fluidized Aerobic Bioreactor and Membrane Bio Reactor (MBR) which are described in sub-subsequent sections. These are widely used and have been approved for projects executed under JNNURM, AMRUT and NMCG program of Govt. of India considering their various parameters such as effluent discharge after tertiary treatment, capital cost, area requirement, operation maintenance cost (energy cost, repair cost, chemical cost manpower cost etc).

4.3.1.4 Sequencing Batch Reactor (SBR)

SBR technology is a variant of ASP technology. This is essentially a batch treatment process by combining, primary settling, aeration, secondary settling and decanting the treated sewage in a series of sequenced and or simultaneous reactions in the same basin on a time deferred cycle. Thus, multiple basins are used whereby when one basin is in one part of the cycle such as aeration, another tank will be settling and discharging the treated sewage in a cyclically repeated operation. High efficiency fine bubble non-clog membrane diffused aeration is preferred.

Schematic diagram of Sequencing Batch Reactor process is presented in **Figure 10** and photograph of an actual plant is given in **Figure 11**.

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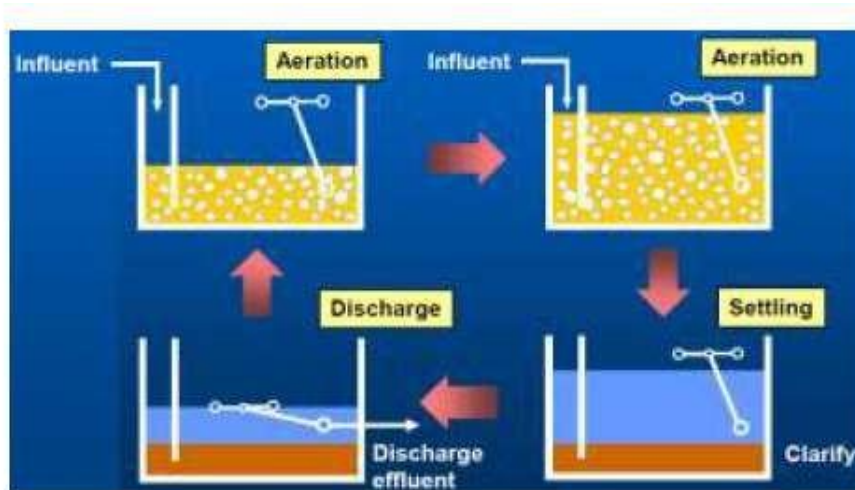


Figure 10: Schematic diagram of Sequencing Batch Reactor (SBR) process



Figure 11: Photo image of SBR technology plant

Advantages	Disadvantages
<ul style="list-style-type: none"> • Can remove N and P concurrent with BOD. • Absence of odour and corrosive gases. • Improved aesthetics. • Does not require separate secondary clarifiers and major return sludge. • pumping stations, good use of common walls, simple square, rectangular or circular structures, can reduce the footprint compared to conventional activated sludge process. 	<ul style="list-style-type: none"> • No provision for sludge management. • No provision of primary treatment to moderate pollution load variations. • Higher energy input if used without bio-methanation. • Requires at least semi-skilled manpower. • Patented process technology and decanters defying local cannibalization.

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Advantages	Disadvantages
<ul style="list-style-type: none"> • Capability to manage and treat variable loading conditions, such as normal, diurnal, dilute monsoon, and shock loads. • Less manpower due to automatic control and easy to operate and to maintain. • High quality effluent for reuse without separate nutrient removal and fine filtration. • Can be expanded as a modular system. • Can also be used with primary clarifiers and conventional F/M ratio for bio-methanation and energy recovery. • The system can generate a stabilized sludge. • Track record for treating 27 MLD diluted sewage at Haridwar and 11.5 MLD at Goa. 	

4.3.1.5 Moving Bed Bio Reactor (MBBR)/ Fluidized Aerobic Bioreactor FAB

This technology is essentially the same as activated sludge except that the media suspended in the reactor offers additional surfaces for the microbes to grow and this in turn maximizes the growth of microbes in a given volume of aeration tank compared to the conventional aeration without the media and to that extent, it does appear preferable. Diffused aeration is of course needed. FAB technology is akin to MBBR except that instead of the media in suspension, the media is kept stationary and fluidized in the aeration tank. Schematic flow diagram of Moving Bed Bio Reactor process is presented in **Figure 12**.

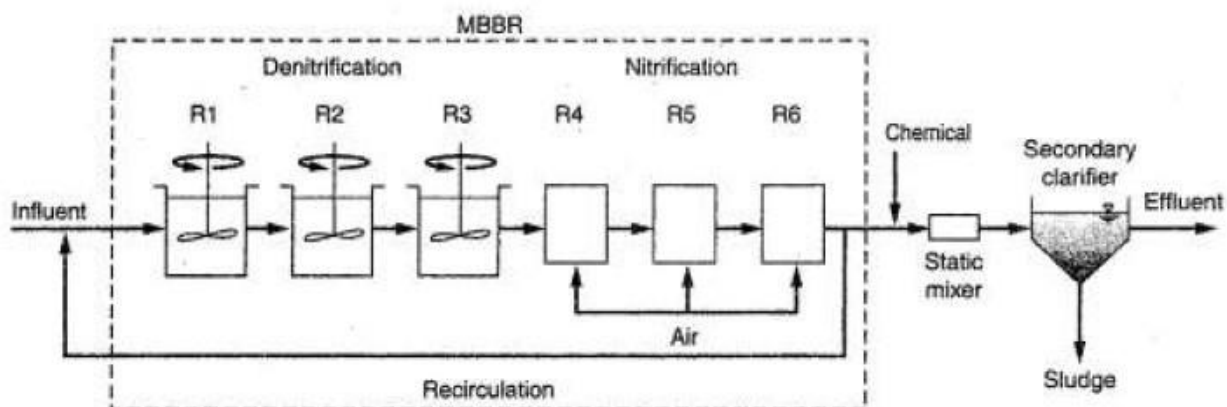




Figure 12: Schematic flow diagram of MBBR process




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Advantages	Disadvantages
<ul style="list-style-type: none"> • There are no limitations of height as long as compressors can be suitably used. • Circular structures can be used to economize on construction costs & time. • The structures can be easily covered for indoor air quality when needed. • Requires lower footprints compared to conventional activated sludge. • Easy to operate and maintain. 	<ul style="list-style-type: none"> • The area per unit volume of the media offered by various vendors are different and also each vendor advocates his own criteria for the relative ratio of volume of media to volume of aeration tank, which makes it difficult to bring about a common and validated standard design criteria. • The quality of plastic of media varies. • The verification of whether the media is moving about the entire volume of the tank or merely clumping at the top layers and if so the method of mixing it up through the tank volume without shearing of the biomass on it are issues of infirmity and which may need gentle movers of the media through the volume of the tank. • Furthermore, the media is a patented product. • Higher energy input if used without bio-methanation.

4.3.1.6 Membrane Bio Reactor (MBR)

The MBR is an important improvement of the widely used activated sludge process. Membranes replace the space consuming final clarifiers. This brings along quite a few important benefits. MBR is more compact. Not only do the membranes require a much smaller footprint, but the biomass concentration in the aeration tanks can also be 10 kg/m³, more than twice the concentration in activated sludge tanks. MBR provides better effluent quality. Depending on the design, very low effluent concentrations for BOD, COD, N and P can be obtained. The TSS concentration is virtually nil. Removal of micro-pollutants is usually better than activated sludge systems. MBR effluent is hygienically safe. The membranes are impermeable to bacteria and viruses. A schematic of the Bioreactor process is shown in **Figure 13**.

The MBR process requires extensive mechanical pre-treatment, for example with rotating sieves, in order to remove all material that can clog or wrap around the membranes. After pre-treatment, the wastewater enters an aeration basin that is very much identical to the ones found in common activated sludge process, but more compact. The basins may be compartmented in order to achieve nitrification and denitrification. Aeration takes place by common bubble aeration. The wastewater then enters the membrane tanks, where the effluent will pass the membrane pores. The sludge is returned to the aeration basin.

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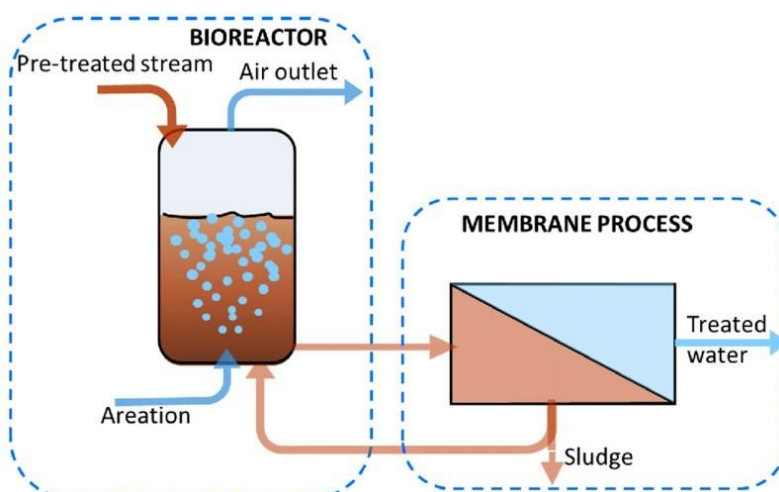


Figure 13: A schematic of the Bioreactor process




Drawbacks of the MBR are its higher energy consumption and the sensitivity of the membranes to clogging. It requires skilled operation. The investment cost is higher than conventional activated sludge plants.

The result of effective primary plus secondary treatment is removal of about 90% of the organic matter, virtually all pathogens, and most solids. Between 10% and 20% of the nitrogen is also automatically removed because the decomposer bacteria require this much for their own growth.

4.3.1.7 Advantages and Disadvantages of selected technologies

The advantages and disadvantages of the technologies in vogue have been consolidated and comparison undertaken as given in **Table 7**.

Table 7: Advantages and Disadvantages of selected technologies

Technology	Advantages	Disadvantages
Conventional activated sludge	<ul style="list-style-type: none"> ▸ small land requirement ▸ widely used and proven technology 	<ul style="list-style-type: none"> ▸ primary and secondary sedimentation required ▸ skilled operation necessary ▸ large quantity of unstable sludge produced ▸ high proportion of mechanical and electrical equipment necessary ▸ high energy consumption ▸ additional sludge treatment required
Sequencing batch reactor (SBR)	<ul style="list-style-type: none"> ▸ small land requirement ▸ proven technology ▸ Capacity to handle shock loads 	<ul style="list-style-type: none"> ▸ high proportion of mechanical and electrical equipment necessary ▸ high energy consumption ▸ medium construction cost
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Technology	Advantages	Disadvantages
	<ul style="list-style-type: none"> ▸ relatively simple operation ▸ production of stabilized sludge ▸ Absence of odor and corrosive gases. ▸ Improved aesthetics. ▸ nitrogen reduction readily achievable ▸ moderate investment 	<ul style="list-style-type: none"> ▸ skilled operation needed
Moving Bed Biofilm Reactor (MBBR/FAB)	<ul style="list-style-type: none"> ▸ small land requirement ▸ robust process and proven technology ▸ relatively simple operation ▸ production of stabilized sludge 	<ul style="list-style-type: none"> ▸ Equalization tank is necessary. ▸ high proportion of mechanical electrical equipment necessary ▸ high energy consumption ▸ medium construction cost ▸ poor nitrogen reduction ▸ secondary sludge treatment required. ▸ Reliance on patented media
Membrane Bio Reactor (MBR)	<ul style="list-style-type: none"> ▸ small land requirement ▸ production of stabilized sludge ▸ nitrogen reduction readily achievable ▸ disinfection of effluent 	<ul style="list-style-type: none"> ▸ very high proportion of mechanical and electrical equipment necessary ▸ complex operation (skilled personnel required) ▸ relatively new technology ▸ very high energy consumption ▸ very high construction cost



4.3.2 Attached growth processes

In attached growth process the microorganisms responsible for conversion of organic material or nutrients are attached to an inert packing material. Attached growth system (fixed film reactor) occurs naturally at any water solid interface as in solids lakes and river bottoms. Their engineered forms are.

- Trickling filters
- Rotating biological contactors
- Submerged media beds (down flow, Up flow, and fluidized bed)
- Land treatment and infiltration system

4.3.2.1 Trickling Filters

Trickling Filters possess a unique capacity to handle shock loads and provide dependable performance with a minimum of supervision. The filter consists of a permeable bed of medium through which the sewage or liquid waste is allowed to percolate. The materials used as filter medium include crushed or broken rock, gravel, blast furnace slag or inert synthetic materials such as plastic and ceramics.

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Randomly packed solid media like rock gravel and slag are characterised by lower porosities (40% - 60%). The trickling filters may be generally circular but square or rectangle may also be used. The sewage is evenly distributed over filter medium, and the treated effluent is collected by the underdrains. The trickling filter is preceded by primary sedimentation so that settleable solids in the sewage may not clog the filter. The trickling filter serves both to oxidise, and bio flocculate the organic material in sewage and their efficiency is assessed on the total reduction in BOD effected through the filter and the subsequent settling tank, since the effluent quality is reckoned after the settlement of bio flocculated solids. Trickling filters may be categorised as low rate, high rate and super rate based on hydraulic and organic loading rates.



4.3.2.2 Rotating biological Contactor

Rotating Biological Contactor (RBC) is one of the relatively recent additions to the family of biological treatment devices. The RBC include low food to microorganism ration resulting in higher efficiencies of organic matter removal, low hydraulic retention periods minimizing tank volume and capital costs, low head loss and lower power requirements, inherent simplicity. The RBC can be adopted for small and medium towns. The RBC consists of a series of closely spaced vertical discs mounted on a horizontal shaft rotating at low speeds normally less than 10 rpm. The disc being perpendicular to the wastewater movement in a cylindrical vessel. The discs also called bidiscs, support biomass and partially submerged in waste water.

The rotation of the disc causes the biomass to be alternatively submerged in wastewater to absorb food and to pick up a thin layer of waste water film to slide down the biomass. The basic process flow sheet of waste water treatment system may consist of primary sedimentation following screening and grit removal, aerobic biological treatment in RBC unit and secondary settling for solid-liquid separation of sloughed film from treated waste water. The settled sludge from primary and secondary sedimentation has to be suitably treated and disposed.

4.3.2.3 Submerged media beds

Submerged media beds treatment is a process used to reduce the organic loading of residential and commercial sewage / wastewater, and in doing so will reduce the Biological Oxygen Demand (BOD) and a significant quantity of Suspended Solids (SS) which if otherwise untreated would contaminate river and sea outfalls, in other words it is used to substantially improve effluent discharge quality. Larger solids settle into the bottom of the primary tank and are removed periodically as sludge, and where other buoyant material which floats upwards is to be removed usually by a



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scraping/screening method. The biodegradable Organic Matter is degraded by the biomass on the media. The Submerged media process uses support media to retain an active biomass to reduce the influent BOD Levels. Tubular diffusers are used with the media giving a good air dispersal and low level of blockage due to growth of biological film.

4.3.2.4 Land treatment and infiltration system

Land treatment is the controlled application of wastewater to the land at rates compatible with the natural physical, chemical and biological processes that occur on and in the soil. The three main types of land treatment systems used are slow rate (SR), overflow (OF), and rapid infiltration (RI) systems. wastewater is applied to shallow basins constructed in deep and permeable deposits of highly porous soils. Wastewater application can be by flooding, or occasionally by sprinklers. Treatment, including filtration, adsorption, ion exchange, precipitation, and microbial action, occurs as the wastewater moves through the soil matrix. Phosphorus and most metals are retained in the soil while toxic organics are degraded or adsorbed. As wastewater percolates through the soil, it can be collected, or it can flow to native surface water or groundwater aquifers. Where the groundwater table is relatively shallow, the use of underdrains allows control of groundwater mounding and recovery of the renovated water. In areas with deeper groundwater, wells are used to recover the renovated water. This recovered water can be for irrigating crops or for industrial uses. This is known as “beneficial reuse.” Water that is not recovered can recharge groundwater aquifers. Requires long term commitment of a significant land area for treatment, with minimal secondary benefits such as are possible with other natural treatment systems (i.e., crop or forest production, habitat enhancement, etc.). Clogging can occur when influent is

However, fixed-film systems (Attached growth process) are more able to cope with drastic changes in the amount of biological material and can provide higher removal rates for organic material and suspended solids than suspended growth systems. Roughing filters are intended to treat particularly strong or variable organic loads, typically industrial, to allow them to then be treated by conventional secondary treatment processes. Characteristics include typically tall, circular filters filled with open synthetic filter media to which wastewater is applied at a relatively high rate. They are designed to allow high hydraulic loading and a high flow-through of air. On larger installations, air is forced through the media using blowers. The resultant wastewater is usually within the normal range for conventional treatment processes.

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4.4 Tertiary Treatment

This treatment is done to polish the effluent received from secondary treatment units to improve the quality of effluent further for reuse. Tertiary treatment is needed only when such greater reuse of waste is contemplated or where the situation dictates the higher quality of effluent. Tertiary treatment may include processes like rapid sand filtration, carbon absorption, ammonia stripping, coagulation and flocculation and ion exchange etc. Evidently the cost of such a treatment is prohibitive and may hardly prove economically viable particularly in developing countries except in certain extremely critical situations.

In order to select the treatment method, cost factor is the prime consideration. The cost of the treatment plant would include the cost of installation, cost of maintenance and operation. The other factors which deserve consideration are cost of construction and maintenance, location, land availability and topographical conditions.

The various tertiary treatment processes are as under:



1. Intermittent Sand filters
2. Oxidation
3. Rapid Sand filters



4.4.1 Intermittent Sand Filters

Intermittent sand filter is a specially prepared bed of sand or other fine material on the surface of which sewage is applied by a under drainage system. Primary and secondary treatments are the requirements before putting the effluent for tertiary treatment on sand beds. Quality of effluent is such that no subsequent treatment is required except disinfection or chlorine dosing. The demerit of this process is that it requires large area of land and considerable quantity of sand. It does not require constant skills of attendance and electrical/ mechanical energy for operation and maintenance. This treatment is suitable for small towns and institutions where discharge is not much. The rate of filtration is between, 20000 gallons to 50000-gallon/ acre/day, depending upon the quality of raw sewage for the treatment.

Quality of effluent of intermittent sand filter is very good. In a properly designed and operated plant, the effluent is clear, colourless, odour less and sparkling. It is completely nitrified, is suitable for irrigation and contains high percentage of dissolved oxygen. It has no settle-able solids, efficiency of removing the bacteria is between 98 to 99% B.O. D about 90% and suspended solids

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over 80%. The main drawback of this system is the huge area of land requirement, which makes the option very uneconomical as the cost of land is very high in urban areas.

4.4.2 Oxidation

This can be divided into three categories.



- i. Where the oxygen is recovered from atmosphere by the contact of sewage with atmospheric air and by sunlight. In this case large Area of land is required and is not suitable for big cities.
- ii. Where Aerators are used for providing extensive air contact and to increase the probability of adding oxygen into the sewage. In this case also, large area of land is required and is not suitable for big cities.
- iii. Aeration of sewage can be done by diffusion of air by perforated pipes and air compressor, this Process is widely in use, but it is economical up to the 1 MGD. Plant only. Further it requires skilled labour for its maintenance and operation, electrical/ mechanical energy is also required for the operation of this process. This process is not suitable.

4.4.3 Rapid Sand Filters

This process is suitable where primary and secondary treatment has been given to the sewage and B.O.D contents of sewage are reduced to less than 30, suspended solids, grease and floating material are also removed in secondary and primary treatment, the rate of filtration in this case is about 2 gallons per sq. ft per minute or 80 to 100 LPM/M². The rate of filtration can further be increased up to 150 LPM/M² by correcting the filter media by using coarser sand of effective size up to 1mm or by using dual media filters.

The rapid sand filter comprises of bed of sand serving as a single medium granular matrix supported on gravel overlying an under-drainage system. The distinctive feature of rapid sand filter compared to intermittent sand filtration is to treat the raw sewage carefully to reduce its BOD to less than 5, along with reduction of suspended solids. Further to effectively flocculate the colloidal particles, use of higher filtration rates and coarser but more uniform filter media to trap influent solids without excessive head loss and back washing of filter bed by reversing the flow direction to clean the entire depth of filter. Pre- treatment of filter influents should be adequate to achieve efficient removal of colloidal and suspended solids.

When water containing suspended material is applied to top of filter bed, suspended and colloidal solids are left behind in the granular media. Accumulation of suspended particle in the pores and

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on the surface of filter medium leads to build up of head loss as pore volume is reduced and greater resistance is offered to flow of water simultaneously with the build-up of head loss to a fore determined terminal value. The suspended solids removal efficiency of successive layers of filter medium is reduced as solids accumulate in the pore space and reach ultimate value of solid concentration, which results into breakthrough of suspended solids and filter quality deteriorates.

Effluent from the secondary treatment plant is pumped to the sump of Tertiary Treatment Plant (T.T.P). This effluent flows in the channel, and required quantity of coagulant (alum), lime and chlorine are mixed before the sewage passes through chute. Increase in the velocity in chute helps in mixing the coagulants in effluent. Thereafter this sewage enters into rapid mixing chamber, (flash mixer) where instantaneous mixing of coagulant is effected through a high speed stirrer. Thereafter this sewage enters into the flocculation chambers at different speeds. Here the flocks will be tendered at different speed to increase in size. After this, flocculated water passes through the settling Tank. In settling tank most of the flocks settle down, then this decanted water is placed over the filter beds, and after filtration the effluent which is quite neat and clean is collected in collecting tank/ sump.

The sludge collected in flocculators & settling tank is drained out by hydraulic pressure and is collected in sludge tank from where it is pumped to Centrifuge /sludge digestion tank.

As a precautionary measure, a heavy chlorine dose @5mg/litre is added in the beginning of tertiary treatment. After pre-chlorination, alum dose @ 30-35 mg/litre, lime @25MG/litre is added as coagulant for flocculating and removing the suspended matter. After going through the entire process, the filtered tertiary treated water is again disinfected with chlorine dose @3 P.P.M. The effluent after tertiary treatment can achieve the following treatment level as given in **Table 8**.

Table 8: Effluent standards fixed after tertiary treatment

Total suspended solids	: Less than 1 mg/ltr
BOD	: Less than 5 mg/ltr
COD	: Less than 60 mg/ltr
Turbidity	: Less than 2 units
Color	: Less than 30 unit

4.4.4 Recommendations on Tertiary Treatment

For many reasons, tertiary treatment is applied with reservation at present. Some reasons are:

1. Psychological attitude of public towards reuse of sewage.
2. Public health conditions also come into hindrance.
3. Economic viability.
4. Public discourage in use of reclaimed waste for agriculture.

In India rarely Tertiary Treatment Plants have been constructed and hence it is recommended that Tertiary Treatment Plants can be added later on in future keeping in view availability of land and funds. Since the final effluent from the proposed STP based on SBR technology will be well within the SPCB accepted standards for discharge into water bodies no tertiary treatment is necessary and as such not included in the project. There are no major industries which can utilize treated effluent in the project area or nearby locations.



For discharging into the nearby waterbodies, the wastewater after secondary treatment of SBR technology need not require any tertiary treatment. For supplying to nearby industries and agricultural and irrigation purposes, the quantity proposed for such industrial and agricultural/irrigation demand in the surrounding area shall be arrived. The sand filter shall be provided with piping and a collection reservoir. Since KWA is nodal agency for pipe water supply for industrial demand, a new industrial water supply scheme may be proposed with source of water as treated wastewater. The drinking water service level can also be improved by sparing the present industrial water supply to drinking water supply.

4.5 Treated Sewage Recycle & Reuse / Disposal System

The reuse and recycling of sewage is defined as the percentage of sewage recycled or reused after appropriate treatment in gardens and parks, irrigation, etc. and, is to be at least 20% to begin with.

The treated sewer can be discharged into a stream river, or it can be used for:

- a) Irrigation of green spaces such as parks, golf courses etc.
- b) Ground water recharge if sufficiently clean
- c) Restricted irrigation of fields where crops can be grown keeping in view the parameters of effluent.
- d) Industrial units
- e) Domestic use for flushing etc.

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The STP sites under IURWTS project are in areas where there are no inhabitants in a radius of 50m from the boundaries of the STP sites and there are no paddy fields nearby. Any kind of industrial units are also not existing in the vicinity of the proposed STP sites. Hence for irrigation of lawns, domestic use of flushing and for use in industrial units, the effluent must be pumped, and distribution system has to be laid which becomes a very costly affair. Proper maintenance for this additional component is also required. Moreover, the ground water is available in sufficient quantity and the same is used economically for the above-mentioned uses.

In general, public of IURWTS catchment are not inclined to the concept of wastewater recycling within the community. The only option left is restricted irrigation in fields and that too only during dry seasons. During rainy season, there is no alternative except disposal of effluent in the nearest water bodies as per prescribed effluent standards. The economic considerations are necessary because, when “first-hand” water is available at a cheaper price, it may not be worthwhile to reuse wastewater, unless there are other special conditions.

Despite a long history of wastewater reuse in many parts of the world, the question of safety of wastewater reuse remains an enigma mainly because of the quality of reuse water. There always have been controversies among the researchers and proponents of extensive wastewater reuse, on the quality the wastewater is to meet. In general, public health concern is the major issue in any type of reuse of wastewater, be it for irrigation or non-irrigation utilization, especially long-term impact of reuse practices. It is difficult to delineate acceptable health risks and is a matter that is still hotly debated.

Considering the wide-ranging potential for wastewater reuse, it may be difficult to set some common quality standards for all types of reuses. Many countries in the world do not have detailed standards or guidelines for recycle and reuse of wastewater. Standards or guidelines for other possible reuses such as groundwater recharge, industrial uses etc., are not common, mainly because such types of reuses are not widespread.

For many countries in Europe, follow either the guidelines of World Health Organization (WHO) or the US Environmental Protection Agency (USEPA) standards form the basis for any decision or for granting permission to any kind of reuse. Countries like old USSR, Israel and Tunisia have developed their own standards for reuse.

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The Government of Karnataka has issued an official directive to take all necessary steps to ensure that only tertiary treated sewage is used for non-potable purposes, like all gardening including parks, resorts, and golf course. In major metropolitan cities like Delhi, Mumbai, Bangalore, and Chennai treated grey water is being used for toilet flushing in some of the major condominiums and high-rise apartment complexes on a pilot scale. In this case, care should be taken to ensure that Ultra filtration membranes are used in the treatment process to safeguard against chances of waterborne diseases.



The only solid waste from the plant is the biological sludge cake. This is used in the root zone of trees in the greenery as a soil filler/organic fertilizer. The quality of the blended discharge for greenery meets the requirements of pollution control.

4.6 Recommendation of sewage treatment plant for IURWTS project

Amongst the recent advanced anaerobic / aerobic treatment processes, processes with reactors such as MBBR, SBR (Sequential Batch Reactors) etc. are being tried. The footprint areas of such processes are lesser as compared to conventional activated sludge process, but their capital cost, process energy requirements as well as operation and maintenance costs are generally high. Such processes have however the advantage of consistent better quality of treated effluent. SBR Technology is amongst one such emerging technology which has the advantage of low footprint area with low sludge production and better effluent quality (BOD < 15).

With the development of simple inexpensive logic controllers (PLC) and the availability of level sensors and automatically operated valves, the sequential batch reactor process (SBR) becomes more widely used. Dissolved Oxygen levels, air flow rates to basin, growth of micro – organisms, decanting rates, etc. are controlled, monitored online, and are adjusted automatically based on varying incoming flow and organic load conditions. This offers consistent and optimized performance of plant with excellent outlet quality even under varying incoming conditions.

Because of the dual function of the SBR tanks, civil construction costs and plant area are lower than for conventional activated sludge. There is a lower requirement for mechanical equipment compared to conventional activated sludge but, against this, the process control system is normally automated and requires extensive use of motorized valves, timers, programmable logic controllers or computers, and other devices. Operation of the system with automated control is relatively easy but skill is needed to adjust the system to cope with changes in loads or wastewater characteristics.

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Moreover, the absence of odour and corrosive gases added to its advantage and will have a good aesthetics.

In recent years SBRs are used for sewage treatment in large cities in many parts of the country. At present more than 24 STPs are in operation and 7 plants are under construction in various states of India.

Comparative analysis of SBR and MBBR technologies has been undertaken by General Consultant based on report publishes by institutes of excellence, Private consultants, government stake holders. A detailed analysis has been undertaken and based on the findings published by these institutes and researchers, SBR technology was recommended for IURWTS catchment by the General consultant (GC). A technical report has been submitted to the client (KMRL) on 27-11-2020 titled “Selection of appropriate technology for sewage treatment plants for IURWTS Catchment” attached as **Annexure 9** of this report.

The most adaptable technology chosen for IURWTS catchment is Sequential Batch Reactor (SBR). This is based on the land constraints, and Cost of land in Kochi city, Effluent quality and operation and maintenance, skill requirements and cost of O&M.



5. Profile of IURWTS Catchment

5.1 Base line Status

5.1.1 Climate and Rainfall

The rainy months in this catchment is during May, June, July, August, September, October, and November. On an average, June is the wettest and January is the driest month. The average decadal amount of annual precipitation in Kochi (1974-2013) is 2885.94 mm. The highest daily rainfall recorded in Kochi in two consecutive year 2018 is 172.9mm and in 2019 it was 197. 60mm. The average daily humidity of Kochi is estimated as 85 percent. The annual variation in temperature is between 22^o C to 33^o C. Temperature increases after February. March and April are generally the hottest months. In the interiors, the day temperature may be a little higher than the coastal region. Winds are generally light to moderate with some increase in force in the summer and monsoon seasons.

In the Southwest Monsoon season the winds are mainly Westerly or North-easterly. During rest of the year winds are North –easterly in the morning and from between South-West and North-West

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in the afternoon. The average annual rainfall is reported as 3014.8 mm, and most of which is received in the period from May to October under the influence of south-west monsoons. June and July are the wettest months of the year, accounting for more than 50% of the annual rainfall. On an average, there are 124.1 rainy days in a year. The average monthly rainfall and rainy days recorded at IMD station Cochin is summarized in **Table 9**.

Table 9: Rainfall statistics of IURWTS catchment

Month	Rainfall (mm)	No. of Rainy days
January	24.3	1.1
February	27.1	1.2
March	45.0	2.6
April	113.1	6.9
May	284.5	11.0
June	700.3	23.0
July	575.5	22.8
August	378.8	19.0
September	310.3	13.4
October	366.6	14.2
November	150.4	7.2
December	39.0	1.8
Total	3014.8	124.1

Source: IMD data, 2019

5.1.2 Geomorphology and soil

The IURWTS catchment fall mainly in the Coastal low land and very limited area in the mid lands of Ernakulam district. The general elevation of the catchment lies from 7.5m to 1m above MSL from east to west. The IURWTS catchment is surrounded by backwaters of Kochi lagoon and low-lying wetlands. Five main canals and several sub drains crisscross the catchment. All the canals and sub drains reaching the main canals are in a dilapidated stage.

5.1.3 Ground water fluctuation

The depth of water level in the western part of the catchment is less than 2mbgl in general and the eastern parts the water table ranges between 4 to 4.5mbgl. When the catchment was in a saturated condition bore logs were taken by the General Consultant and the level of the water table below ground level is given in **Table 10** and **Figure 14**.





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Table 10: Geotechnical Investigation data by FUGRO 2020

Sl. No	Location ID	Field Activity Dates		Coordinates		RL, mCD	TD, m	Borehole Water Depth, m
		From	To	Easting, m	Northing, m			
Thevara Perandoor								
1	TPC LBH-01	19/09/2020	22/09/2020	640446.00	1107685.00	1.25	45.42	1.00
2	TPC LBH-02	19/09/2020	23/09/2020	642243.00	1101958.00	-0.08	40.95	2.80
3	TPC LBH-03	23/09/2020	28/09/2020	641101.00	1106197.00	3.81	45.45	2.70
4	TPC LBH-04	24/09/2020	26/09/2020	640744.00	1107068.00	1.74	40.95	1.20
5	TPC LBH-05	26/09/2020	01/10/2020	641758.00	1102524.00	1.90	45.45	2.50
6	TPC LBH-06	29/09/2020	01/10/2020	640766.00	1106801.00	1.57	40.95	3.60
7	TPC LBH-07	29/09/2020	03/10/2020	641519.00	1103828.00	1.38	50.45	5.10
8	TPC LBH-08	03/10/2020	07/10/2020	642455.00	1100196.00	1.33	50.45	2.50
9	TPC LBH-09	04/10/2020	07/10/2020	642400.80	1100705.00	3.03	50.45	3.35
10	TPC LBH-10	05/10/2020	08/10/2020	641564.00	1104033.00	3.83	50.45	5.30
11	TPC LBH-11	09/10/2020	13/10/2020	642261.00	1101798.00	1.62	50.41	0.80
12	TPC LBH-12	08/10/2020	13/10/2020	641368.00	1105273.00	2.16	46.89	1.00
13	TPC LBH-13	10/10/2020	14/10/2020	641551.00	1104297.00	1.90	45.45	0.90
14	TPC LBH-14	15/10/2020	19/10/2020	642234.00	1101146.00	1.26	50.23	1.05
Chilavanoor canal								
1	CLC LBH-03	08/09/2020	10/09/2020	642157.00	1106411.00	1.833	45.45	1.233
2	CLC LBH-04	16/08/2020	21/08/2020	642340.00	1105651.00	2.177	50.45	-1.923
3	CLC LBH-05	24/08/2020	27/08/2020	642413.70	1105441.00	2.265	45.45	-0.835
4	CLC LBH-06	28/08/2020	01/09/2020	642524.00	1105206.00	2.540	45.35	0.940
5	CLC LBH-08	17/08/2020	25/08/2020	642629.00	1104858.00	1.388	48.05	0.288
6	CLC LBH-09	02/09/2020	05/09/2020	642681.00	1104529.00	1.588	44.62	-2.412
7	CLC LBH-10	24/08/2020	27/08/2020	642820.00	1103921.00	1.365	49.68	-0.735
8	CLC LBH-11	07/09/2020	10/09/2020	642229.00	1103634.00	2.310	45.45	-1.690
9	CLC LBH-12	29/08/2020	02/09/2020	642809.00	1103307.00	1.909	48.52	0.259
10	CLC LBH-13	27/08/2020	03/09/2020	642914.00	1103274.00	1.310	45.45	-0.990
11	CLC LBH-15	03/09/2020	06/09/2020	643196.00	1102662.00	2.220	50.25	1.120
12	CLC LBH-16	07/09/2020	08/09/2020	643468.00	1102103.00	1.865	9.45	0.115
13	CLC LBH-17	19/09/2020	15/09/2020	643850.00	1100644.00	1.353	45.45	-0.347
14	CLC LBH-18	21/09/2020	23/09/2020	641983.00	1107291.00	2.004	40.95	-0.996
15	CLC LBH-19	12/09/2020	18/09/2020	642003.00	1107803.00	1.918	40.52	0.268
16	CLC LBH-20	15/10/2020	17/10/2020	643215.00	1102509.00	1.60	40.38	0.80
17	CLC LBH-21	22/10/2020	24/10/2020	641378.00	1109141.00	0.29	36.30	-0.46
Note: TD- Termination Depth, RL- Reduced Level, CD-Chart Datum.								

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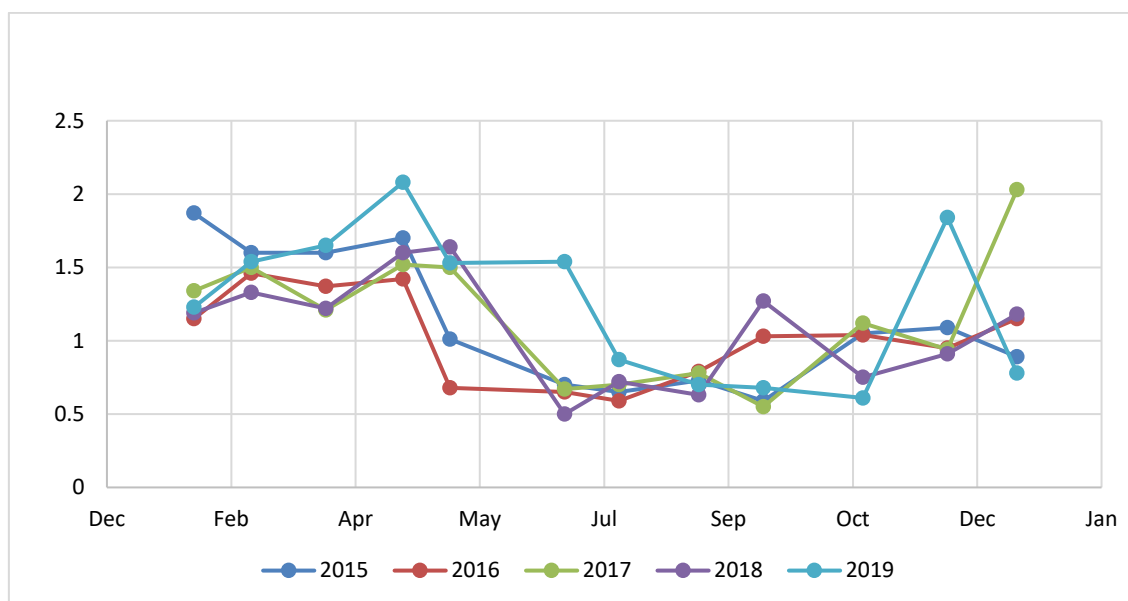


Figure 14: Ground Water Variation in project command

5.1.4 Geology

The geological succession of IURWTS Edappally catchment is as follows,

- Recent sediments (Alluvium, Teri's, Brown sand etc.), Mud banks Laterite.
- Achaean – Basic Dykes, Charnockites, Gneisses.
- The entire western part is covered by recent sediments.

5.1.5 Land Use

As per the land use survey undertaken by Department of Town and country planning (2009)³, the general land use of Kochi corporation is followed. Edappally south catchment corporation limits has residential area (73%), commercial (3%), Public and semi-public area (6.5%), Industrial area (2.50%), Transportation (8%), Parks and open spaces (1%), unclassified area (5.75%), Agriculture (0.25%). The STP site at Vennala is in the wetland area on the southern end of the catchment. The land use pattern of the municipality area is slightly different from the corporation area and the general land use pattern is residential area (67%), commercial (1%), Public and semi-public area (11%), Industrial area (9.50%), Transportation (7.35 %), Parks and open spaces (0.15%), Agriculture (4.0%).

i. The land use pattern for Kochi corporation is as given **Table 11**.

Table 11: Existing land use (2009)-Kochi Corporation



SL. No.	Land use category	Land area in Ha	Existing %(Gross)	Existing % (Net)
1.	Residential	5040.93	53.13	73.07
2.	Commercial	211.64	2.23	3.07
3.	Public & Semi public	444.8	4.69	6.45
4.	Industrial	173.5	1.83	2.51
5.	Transportation	553.58	5.83	8.02
6.	Park & Open spaces	66.68	0.7	0.97
7.	Other (SEZ and Unclassified area)	397.3	4.19	5.76
8.	Paddy land / Wet land	441.02	4.65	
9.	Agriculture/Dry Cultivation	10.22	0.11	0.15
10.	Water bodies	2148.33	22.64	
Total		9488	100	100.00

Source: Land use survey updated by the Department of Town and Country Planning in 2009

ii. Land use pattern for Kalamassery municipality is as given in **Table 12**.

Table 12: Existing land use (2009) - Kalamassery Municipality

Sl. No.	Land use category	Land area in Ha	Existing % (Gross)	Existing % (Net)
1.	Residential	1176.23	43.56	52.61
2.	Commercial	26.87	1.00	1.20
3.	Public & Semi public	405.55	15.02	18.14
4.	Industrial	385.1	14.26	17.22
5.	Transportation	195.55	7.24	8.75
6.	Park & Open spaces	1.42	0.05	0.06
7.	Hazardous	0.8	0.03	0.04
8.	Paddy/ Wet land	430.41	15.94	
9.	Agriculture/Dry Cultivation	44.28	1.64	1.98
10.	Water bodies	33.79	1.25	
Total		2700	100	100.00

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iii. Land use pattern for Thrikkakkara municipality is as given in **Table 13**.

Table 13: Existing land use (2009)- Thrikkakkara Municipality

Sl. No.	Land use category	Land area in Ha	Existing % (Gross)	Existing% (Net)
1.	Residential	1216	44.28	62.63
2.	Commercial	10.06	0.37	0.52
3.	Public & Semi public	162.16	5.91	8.35
4.	Industrial	196.01	7.14	10.10
5.	Transportation	117.77	4.29	6.07
6.	Park & Open spaces	2.9	0.11	0.15
7.	Paddy/ Wet land	709.38	25.83	
8.	Agriculture/Dry Cultivation	236.53	8.61	12.18

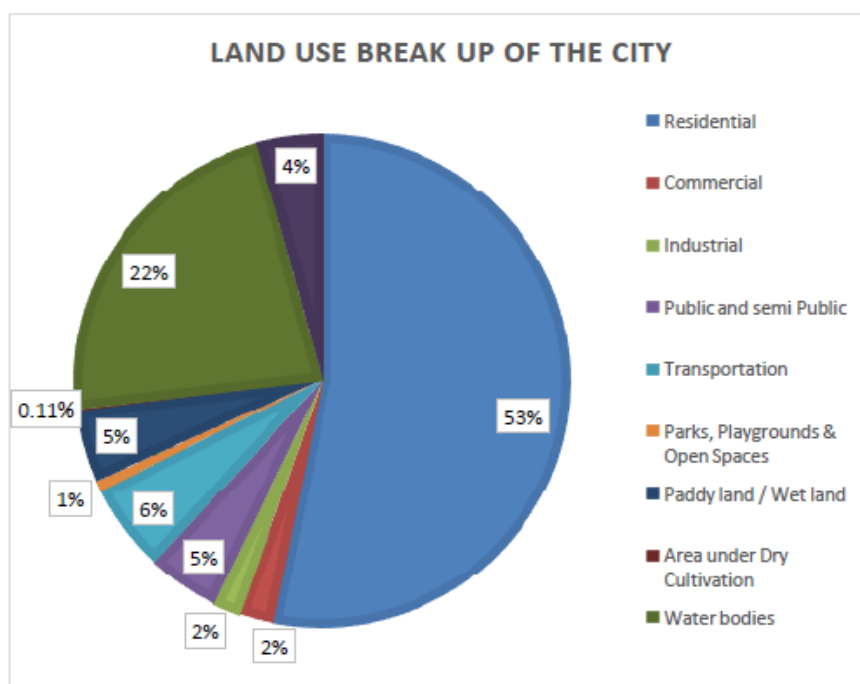
iv. Land use pattern for Thripunithura Municipality is as given in **Table 14**.

Table 14: Existing land use (2009)- Thripunithura Municipality

Sl. No.	Land use category	Land area in Ha	Existing % (Gross)	Existing% (Net)
1.	Residential	1025.64	54.88	84.33
2.	Commercial	22.23	1.19	1.83
3.	Public & Semi public	77.71	4.16	6.39
4.	Industrial	18.2	0.97	1.50
5.	Transportation	72.47	3.88	5.96
6.	Paddy/ Wet land	507.75	22.8	
7.	Water bodies	145	7.76	
Total		1869	100	100.00

5.1.6 Land environment

The characteristic feature of the land utilization pattern in the Kochi City is the predominance of water bodies and wetland. A pictorial representation is given below in **Figure 15**.





Source: ENVIS Newsletter Volume IV (1), January - March 2015

Figure 15: Land use break up of Kochi city

5.1.7 Water Quality of the IURWTS canals

The water samples from various locations were collected where the canal is found to be stagnant, at locations where there was change in canal characteristics, near identified sources of pollution etc. The physical, chemical, and biological parameters have already been analysed in NATPAC DPR (2018) in detail. To validate the findings in the NATPAC report (2018), ANTEA GROUP has arranged a separate NABEL accredited agency in March 2020 for undertaking water quality studies. The water sampling locations are provided in **Figure 16**. Detailed water quality study will also be undertaken again as part of the Environmental impact assessment process also.

The studies undertaken as part of the NATPAC DPR (2018) has brought out high nutrient content at most of the studied stations in Cochin back water. They have related this high nutrient condition to available under water vegetation in the region. Assimilative capacity of inshore waters of Cochin was also assessed using data on hydrography and averaged for a period of three years. Results have revealed that in the estuary, total suspended sediments and cadmium have reached critical level while copper and lead concentration has attained level of caution.

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The pH value in the samples were observed within the limits of BIS water quality standards for surface water sources. High values of pH at Market canal was observed due to stagnant water and discharge of market waste into the canal. The fish market liquid and solid waste are directly discharged into the canal resulted the maximum concentration of TDS at Thevara bridge sample. The maximum and minimum concentration of turbidity was recorded at NH road bridge of Edappally canal and Thevara bridge of Thevara canal.

The concentration of conductivity, total hardness, chloride, sulphate, nitrate, calcium, and magnesium are well within the limit specified in the BIS standards. The concentration of conductivity, total hardness, chloride, sulphate, nitrate, calcium, and magnesium were maximum at Thevara bridge sample of Thevara canal. Due to the absence of tidal movement the canal is heavily silted and discharge from fish market right bank of the canal results the higher concentration of above pollutants. It is observed that the iron concentration at all sections of the canals are well beyond the permissible limit. E- Coli index at all samples are well beyond the permissible limit for drinking water standards and it is not fit for drinking purpose at any cause.

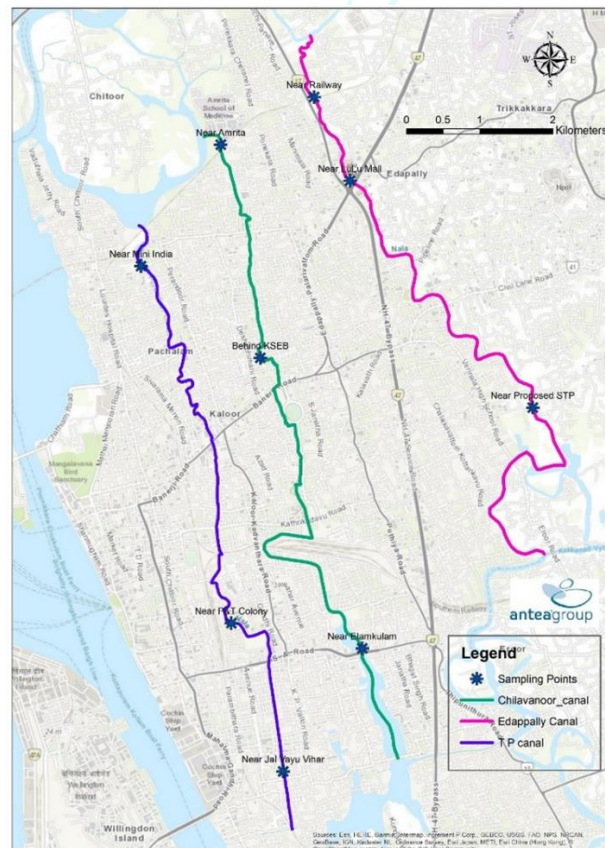




Figure 16: Water sampling locations in IURWTS canals

<p>Consultant:</p>  <p>anteagroup</p>	<p>DPR: Sewer network & Elamkulam 17.5 MLD STP</p>	<p>Project:</p> <p>IURWTS</p>	<p>Client:</p> 
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6. Sewage Treatment Plant (17.5 MLD SBR) at Elamkulam

As a component of sewerage system of IURWTS Project, originally Muttar STP was proposed for 7 MLD capacity for treating North Catchment of Chilavanoor Canal and Edappally Canal. When the DPR submitted for vetting by CUBE IIT, they strictly instructed to fix the sewer load and treatment capacity of individual STP based on projected population for 30 years from a base year of 2025 and the data should be sourced from an authenticated agency.



IURWTS project had proposed 4 Sewage Treatment Plants for treatment of sewer load generated in the catchment area covered and are located at Vennala, Muttar, Perandoor at the tail ends of the canals and at Elamkulam at KWA STP site, as an upgradation of the existing outdated STP with capacity 4.45 MLD. The sewerage Scheme for Perandoor Zone and Muttar Zone were already finalized, and the detailed Engineering Reports were submitted for approval.

The STP site at Elamkulam is own property of KWA and as per the directions from MD, KWA, they are also proposing sewerage schemes for the Kochi in Ernakulam area for the left-out portions of IURWTS project area and the existing KWA Sewer area.

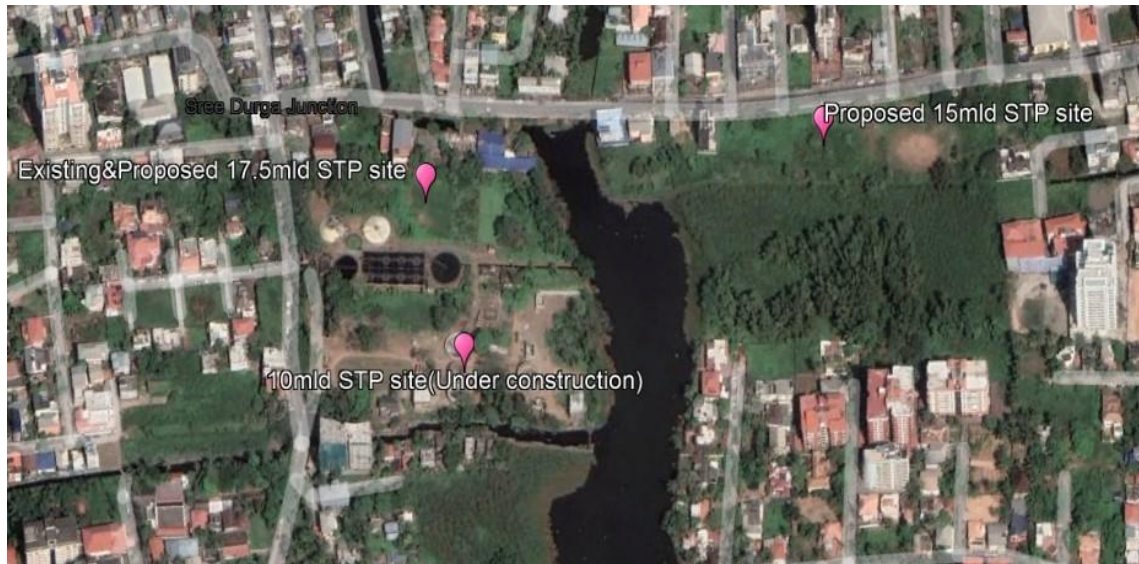
The left out portions adjacent to the catchment area of Edappally and Perandoor canal North are of nominal extent and are proposed to convey to the respective STP under IURWTS (Vennala , Muttar and Perandoor). Vaduthala Zone of KWA is also proposed to be treated in the new STP at Perandoor. Out of 44 divisions of Ernakulam area, 21 divisions (Divisions 31 to 38, 40 to 42, 46, 47 and 50 and parts of 3 divisions (Div. 39, 48 and 51) is covered in the above mentioned three STPs. The sewer load generated in the balance area (20 Divisions. and part of 39, 48 and 51) is proposed to convey and to treat in the existing Elamkulam STP site.

Elamkulam STP site

KWA has their own land at Elamkulam located in between Fathima Matha Church Road and Subhash Chandra Bose Road having a total extent of 5.36 Hectares. There are two lands separated by Chilavanoor Canal and private property west side of the canal. One land has an extent of 3.14 Hectare located along Fathima Matha church Road where the existing STP of 4.45 MLD and newly completed 5MLD STP(Amrut) are located. The other land is along Subhash Chandra Bose Road having an extent of 2.22 Hectares and is at a distance of 400 m from Fathima Matha church road.

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KWA is planning to convey the sewer load generated in the balance Ernakulam area (Division 31 to 74) to 3 sewage treatment Plants of treatment capacities 17.5 MLD, 15 MLD and 10 MLD proposed in the existing STP sites, Elamkulam.



Existing STP and Pumping stations

There is an existing sewerage system in Kochi, which serves only a small central area of the Municipal Corporation. To date only some pockets in the centrally congested area of Ernakulam South Is provided with sewerage system. The coverage of the existing sewerage system is only 5% of the Municipal Corporation area. An extent of 2.5 sq.km. in the main heart of the city i.e. General Hospital area and 1.50 sq.km. in Gandhi Nagar area are covered by the existing sewerage system. The existing Sewage Treatment Plant located at Elamkulam is having a capacity of 4.45 MLD. The plant works in the activated sludge process of Treatment. The plant was commissioned as early in 1955.

There are two main pumping stations with the existing network one at Kadavanthra (Muttathil) and the other at the Maharaja's college ground at MG Road, for collecting the sewer load from the existing network and then pumping to 4.45 MLD STP at Elamkulam. Capacity of both the wet wells is 1300m³. Pump set capacity for the MG Road station is 30HP whereas the Kadavanthra Station is 75HP.

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Newly completed STP and KWA proposals for Ernakulam area

A 5MLD STP under AMRUTH schemes proposed in the same site nearby the existing old STP is almost completed. The existing network area along with an additional new area of 1.75 Sq.km for its full utilization is intended to link to the new STP. Since provision for future expansion for another 5MLD STP attaching to this plant totalling its capacity to 10MLD was already finalized and DPR had submitted by KWA for approval from higherups. The old STP is to be dismantled and based on the availability of spare area, a new STP of 17.5MLD is planned to construct in same location.



The Ernakulam area is with a calculated sewer load of 49.06 MLD in the projected year of 2055 and there is a necessity of one more STP and hence another STP of treatment capacity of 15 MLD is proposed in the land in the western side of Chilavanoor canal to meet the full requirement of Ernakulam area of Kochi corporation.

KWA has worked out the sharing load to each of the plant and is shared with KMRL and is attached herewith as **Annexure 1**. Since the area is considerably large and KWA has their own land in the various places of city adequate for well and pumping stations, five (5) more collection wells are proposed which are found unavoidable due to the Railway, metro and NH crossings, more distant area to connect to the network.

Elamkulam Zone of sewerage scheme of Kochi Corporation consists of 20 divisions fully and 3 divisions partially. The census population 2011 of Elamkulam zone including the existing network area is 172464 and the population projected for the design period of 30myears with base year 2025 is works out to 223174. Present population is estimated as 182870. Households as per 2011 census population is 43116. The anticipated households in the base year of 2025 are 46800.

In discussion with KWA and KMRL sewer expertise, since KMRL has proposal for upgradation of existing STP, the proposed 17.5 MLD STP is included in the DPR preparation of IURWTS Sewerage System- Elamkulam STP and Sewer. The divisions fall within IURWTS project area which consists of 500m corridor on either side of Chilavanoor canal and Thevara-Perandoor Canal South catchment is taken separately from the total Ernakulam area for network designing under IURWTS Project.

In addition to the existing wells at MG Road and Muttathil, KWA has proposal for the construction of 4 new collection well cum Pumping station in their own lands in adequate locations to avoid alignment of trunk mains (gravity mains with manholes) across the Railway lines, National and

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congested state Highways, Canal, and metro routes. A well cum pumping station is found unavoidable near Thevara Canal is also included in this project. As a total 9 pumping stations are finalized for collecting and conveying sewer loads from respective blocks of KWA area as well as IURWTS area to STPs at Elamkulam.

The DPR with the above components was submitted on 2/08/2022 and was scrutinised by CUBE IIT. To avoid the lift manholes with heavier loads which may cause clogging of manholes, CUBE has directed to propose an additional collection well in the sewer area of Chilavanoor South Catchment. Block 12 has been divided into two. The sewer load generated in Block 12 B is proposed to collecting in the newly proposed well at a chainage of 4500 of Chilavanoor canal. The load from this well is pumping to the Well at Kaloor which is then pumping to STP for treatment.

This Detailed Engineering Report is the revised DPR incorporating all the additions and alterations recommended by CUBE IIT.

The details of Projected population and sewer load is tabulated in **Table 15** below.





Consultant: 	DPR: Sewer network & Elamkulam 17.5 MLD STP	Project: IURWTS	Client: 
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Table 15: Projected population and sewer load

12.ELAMKULAM ZONE									ELAMKULAM STPs 2055																		
Sl. No.	DIVISION	sewer load in year end NAME	2020	2021	2025	2035	2040	2050	2055	17.5 MLD STP- Load 2055 in MLD						15 MLD STP- Load 2055 in MLD						5 MLD STP- Load 2055 in MLD					
			TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	TOTAL	Total	KMRL	KWA	Load Total MLD	KMRL	KWA	Total	KMRL	KWA	Load Total MLD	KMRL	KWA	Total	KMRL	KWA	Load Total MLD	KMRL	KWA
1	39 (41%)	KARUKAPPILLY	0.75	0.75	0.77	0.81	0.83	0.87	0.89							41%	41%		0.89	0.89							
2	43 (100%)	PALARIVATTOM	1.93	1.94	1.98	2.08	2.14	2.25	2.31							100%		100%	2.31		2.31						
3	44 (100%)	KARANAKKODAM	1.86	1.87	1.91	2.01	2.06	2.17	2.22							100%	53%	47%	2.22	1.18	1.04						
4	45 (100%)	THAMMANAM	1.71	1.72	1.75	1.84	1.89	1.99	2.04							100%	24%	76%	2.04	0.49	1.55						
5	48 (25%)	PONNURUNNI EAST	0.30	0.30	0.30	0.32	0.33	0.34	0.35							25%		25%	0.35		0.35						
6	49 (100%)	VYTTILA	1.28	1.29	1.31	1.38	1.42	1.49	1.53	80%	0	80%	1.23	0	1.23	20%		20%	0.31		0.31						
7	51 (40%)	POONITHURA	0.60	0.60	0.61	0.65	0.66	0.70	0.71	40%		40%	0.71		0.71												
8	52 (100%)	VYTTILA JANATHA	1.80	1.81	1.84	1.93	1.98	2.09	2.14	100%	58%	42%	2.14	1.24	0.90												
9	53 (100%)	PONNURUNNI	1.78	1.79	1.82	1.92	1.97	2.07	2.12							100%	55%	45%	2.12	1.17	0.96						
10	54 (100%)	ELAMKULAM	2.14	2.15	2.19	2.30	2.36	2.48	2.55													100%		100%	2.55		2.55
11	55 (100%)	GIRINAGAR	1.36	1.36	1.39	1.46	1.50	1.58	1.62	100%	70%	30%	1.62	1.13	0.49												
12	56 (100%)	PANAMPILLY NAGAR	1.56	1.57	1.60	1.68	1.73	1.82	1.86	100%	85%	15%	1.86	1.59	0.28												
13	57 (100%)	KADAVANTHRA	2.24	2.25	2.30	2.42	2.48	2.61	2.68	100%	26%	74%	2.68	0.70	1.98												
14	58 (100%)	KONTHURUTHY	1.58	1.59	1.62	1.70	1.75	1.84	1.88	100%		100%	1.88		1.88												
15	59 (100%)	THEVARA	1.30	1.31	1.33	1.40	1.43	1.51	1.54	100%		100%	1.54		1.54												
16	60 (100%)	PERUMANOOR	1.99	2.00	2.04	2.14	2.20	2.31	2.37	100%	61%	39%	2.37	1.45	0.92												
17	61 (100%)	RAVIPURAM	1.18	1.19	1.21	1.28	1.31	1.38	1.41	100%		100%	1.41		1.41												
18	62 (100%)	ERNAKULAM SOUTH	1.48	1.48	1.51	1.59	1.63	1.72	1.76													100%	18%	82%	1.76	0.32	1.44
19	63 (100%)	GANDHINAGAR	1.74	1.75	1.78	1.87	1.92	2.02	2.07													100%	68%	32%	2.07	1.41	0.66
20	64 (100%)	KATHRIKADAV	2.00	2.01	2.05	2.16	2.21	2.33	2.39							50%	50%		1.19	1.19		50%	50%		1.19	1.19	
21	65 (85%)	KALOOR SOUTH	1.34	1.34	1.37	1.44	1.48	1.55	1.59							60%	60%		1.12	1.12		25%	25%		0.47	0.47	
22	66 (100%)	ERNAKULAM CENTRAL	1.74	1.75	1.78	1.87	1.92	2.02	2.08													100%	24%	76%	2.08	0.50	1.58
23	67 (60%)	ERNAKULAM NORTH	0.71	0.71	0.72	0.76	0.78	0.82	0.84													60%		60%	0.84		0.84
		TOTAL	34.35	33.81	35.21	36.25	37.18	39.12	40.96				17.45	6.10	11.35				12.56	6.05	6.52				10.96	3.89	7.07

For Elamkulam STP capacity for the year 2055 (MLD)
 KMRL KWA
 Kochi Corporation
 16.03 24.93 40.96 MLD

17.5 MLD STP		15 MLD STP		10 MLD STP	
KMRL	6.10	KMRL	6.05	KMRL	3.89
KWA	11.35	KWA	6.52	KWA	7.07
Total	17.45	Total	12.56	Total	10.96

IURWTS Project Sewerage System -Elamkulam zone



The IURWTS Project area for treatment at Elamkulam STP consists of zone 4 and zone 6 , that is, south catchment area on either side Chilavanoor Canal and Thevara-Perandoor Canal .The project area includes 14 divisions (partially/ fully) of Kochi Corporation. The Projected population for the year 2055 and the sewer load calculations are done as per KWA Master Plan. Based on the location pumping stations and STP locations IURWTS project area has been divided into 9 blocks. The population as per census 2011 for Elamkulam zone covered by IURWTS project is 67484 and the projected population.

Near Thevara Canal one well cum pumping station is newly proposed by KMRL to collect and convey the sewer load from catchment area of TP canal south end meeting Thevara Canal including KWA. For block names to be unique, block number for Elamkulam starts as Block 5 and ending at Block 13. (Block 1 Perandoor and Block 3 to 4 Muttar). The existing pumping stations of KWA at Muttathil lane and nearby MG Road are underutilization and are also included in this scheme for fully utilizing its capacity. The flow diagram is as shown in **Figure 5**.

Population and sewer load of individual blocks were calculated and is as per the **Table 16**.

Table 16: Population and Sewer load of individual blocks

Elamkulam Catchment								
Sl. No	From	Ward s		Population				To
				2011	2025	2040	2055	
1	Block 5	53,52		10148	11016	12028	13132	
				10148	11016	12028	13132	Trunk Main -Direct to STP
2	Block 6	57	20.5 %	2310	2507	2737	2989	
		55	17.2 %	1171	1271	1388	1515	
				3481	3778	4125	4504	Trunk Main -Direct to STP
3	Block 7	60	19.0 %	1898	2060	2249	2456	
				1898	2060	2249	2456	To Thevara Well
4	Block 8	55	52.8 %	3595	3902	4260	4652	
		57	5.5%	620	673	734	802	
		60	42.0 %	4186	4543	4961	5416	

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Elamkulam Catchment								
Sl. No	From	Ward s		Population				To
		56	85.0 %	6672	7242	7907	8633	
				1507 2	1636 0	1786 2	1950 3	To Cheruparambathu Well
5	Block 9	63	44.1 %	3845	4174	4557	4976	
				3845	4174	4557	4976	To Muttathil Well
6	Block 10	62	14.8 %	1096	1189	1299	1418	
				1096	1189	1299	1418	To Padiyath Well
7	Block 11	62	3.2%	238	258	282	307	
		66	24.0 %	2096	2275	2484	2712	
				2334	2533	2766	3020	To MG road Well
8	Block 12 A And Block 12 B	63	23.9 %	2085	2263	2471	2698	BLOCK 12B to the newly proposed well at Kathrukadavu and then to Kaloore well which is the well for collecting sewer load of BLOCK 12A
		64	95.0 %	9545	1036 1	1131 2	1235 1	
		65	85.0 %	6704	7277	7945	8675	
		44	33.0 %	3087	3351	3658	3994	
		45	5.0%	429	466	509	555	
		39	41.0 %	3758	4079	4454	4863	
				2560 8	2779 7	3034 9	3313 7	
9	Block 13	64	5.0%	502	545	595	650	
		44	20.0 %	1871	2031	2217	2421	
		45	19.0 %	1631	1770	1932	2110	
				4004	4346	4745	5181	To Thammanam Well
	GRAND TOTAL			6748 4	7325 3	7998 0	8732 6	

Projected Population and sewer load of individual blocks were calculated and is given in **Table 17**.





Consultant: 	DPR: Sewer network & Elamkulam 17.5 MLD STP	Project: IURWTS	Client: 
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Table 17: IURWTS Sewerage scheme Elamkulam Zone (2055)

Zone 4&6 (TP S/Catchment) & Zone 4 (Chilavanoor S/Catchment) (No. of blocks-10)											
Sl. No.	Description	BLOCK 5	BLOCK 6	BLOCK 7	BLOCK 8	BLOCK 9	BLOCK 10	BLOCK 11	BLOCK 12A	BLOCK 12A	BLOCK 13
1	Projected population (Persons)	13132	4504	2456	19503	4976	1418	3020	16612	16525	5181
2	Domestic Demand @150LPCD (MLD)	1.970	0.676	0.368	2.925	0.746	0.213	0.453	2.492	2.479	0.777
3	Floating population (Persons)	7223	2477	1351	10727	2737	780	1661	9137	9088	2849
4	Floating Demand @ 70 LPCD (MLD)	0.506	0.173	0.095	0.751	0.192	0.055	0.116	0.64	0.635	0.199
5	Nondomestic demand (MLD)	0.304	0.104	0.057	0.452	0.115	0.033	0.070	0.385	0.768	0.120
6	Waste water generated (%)	85%	85%	85%	85%	85%	85%	85%	0.383	85%	85%
7	Quantity of waste water generated(MLD)	2.363	0.810	0.442	3.509	0.895	0.255	0.543	2.989	2.972	0.932
	Total (LPD)	23627 61.20	8104 17.1 3	4418 61.1 4	3509 103.6 1	8952 21.8 6	2550 98.5 7	5433 64.4 0	2988 896.5 1	2973 221.1 7	9321 50.0 8
	GWl @4500liters per kilometre sewer length	48220 .99	1653 9.55	9018 .21	7161 6.95	1827 0.99	5206 .25	1108 9.58	1827 0.89	1034 11.42	1902 4.82
		0.048	0.016	0.009	0.072	0.018	0.005	0.011	.018	0.104	0.019
	Total (LPD)	24109 82.19		45087 9.35	358072 0.56	91349 2.85	26030 4.82	55445 3.98		608380 0.00	95117 4.89
	Elamkulam	2.41	0.83	0.45	3.58	0.91	0.26	0.55	3.007	3.073	0.95
		16.033	MLD								

This DPR includes the construction of 17.50 MLD STP at Elamkulam and Sewer network for 16.033 MLD of IURWTS Project area in south catchment areas of Thevara-Perandoor canal and Chilavanoor canal.

This project report deals with Elamkulam STP lying in the catchment of Chilavanoor canal and at latitude 9° 58' 16.47" N and longitude 76° 18' 23.04 E" of the catchment. It is located at a distance of 0.6 Km from Kochi Metro station at Elamkulam and at a distance of 25Km from Kochi international airport and 2 Km from the nearest South railway station in the catchment.

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The land is having plane topography and the ground water table is at a higher level. The bearing capacity of the soil strata is very poor. The location being a part Ernakulam District experiences more or less uniform temperature throughout the year. The major rainfall is from Southwest monsoon which contributes 63% of the annual rainfall. The site has an extent of 1.86 hectares.



The existing corporation road -Fathima Matha church Road- in the eastern side of STP site is the access to the proposed plant site. The technology option selected based on parametric analysis of different technologies is SBR based STP which is an emerging technology is gaining acceptance among various water and wastewater authorities of different states.

In Kochi, the land cost is very high and location of STP shall be that it shall not cause any unhealthy conditions to the inhabitants of the surrounding area. In view of this for minimising the land area and the standard effluent characteristics SBR technology is found most suitable. The system adopted has much fewer moving parts inside the bioreactor. This gives the advantage of continuously running the bio-reactor system, under widely fluctuating conditions. It is also to be mentioned that required pumps / blowers and centrifuges are manufactured in India only, and hence there is no problem of availability of spares. All the maintenance on the mechanical systems can be done with normal skilled mechanics available.

The system is unique in operation, such that, only inlet and outlet parameters (i.e. raw sewage BOD / COD / TSS and treated sewage BOD / COD / TSS etc.) need to be analysed. The outlet BOD of the reactor system being very low (in other words, hardly any food is available to the E-coli), most of the coli forms are killed in the reactor itself. Remaining coli form is killed by nominal chlorine dosing. The treated sewage outlet coli form count will conform to WHO standards, with such low chlorine doses. This will also ensure that there is not much residual chlorine. This makes the system more suitable for the disposal in to surface waters without any detrimental effect on aquatic life. The generated sludge volume, fully stabilized, is reported to be much lesser than that form other technologies.

6.1 Design Scheme Capacity

The object of sewage treatment is to stabilise decomposable organic matter present in sewage so as to produce an effluent and sludge which can be disposed off in the environment without causing health hazards or nuisance. Hence for designing a sewage treatment plant, it is essential to analyse the sewage quantity and raw sewage characteristics and desired quality of the effluent.

Consultant: 	DPR: Sewer network & Elamkulam 17.5 MLD STP	Project: IURWTS	Client: 
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The design of a Sewage Treatment Plant is based on the coverage area population raw sewage characteristics, Treated effluent standards etc.



6.2 Covered area

The proposed STP at Elamkulam is for sewage treatment of areas of Zone 4 (Chilavanoor south catchment) and zone6 (Thevara-Perandoor south Catchment) which includes catchment area of 10.402 sq.km.

A net area of 8.59 Sq.km is the covered area for the treatment of sewage in the newly proposed 17.5 MLD plant at Elamkulam. The sewer network includes Perandoor south and Chilavanoor South catchment areas. The Perandoor south catchment area has an extent of 3.66 Sq.km starts from Banerji Road 350m away from Kochi Metro station and ends at Thevara and having a flow direction in the North-South. The Chilavanoor south catchment area has an extent of 4.93 Sq.km starts from Banerji Road 350m away from Kochi Metro station and ends at Thevara and having a flow direction in the North-South. The density of population as per 2011 is about 6672 persons/ sq.km for Kochi Corporation. The sewer network caters to parts of 14 Divisions (39, 44, 45, 52, 53, 55, 56, 57, 60, 62, 63, 64, 65, 66) of Kochi Corporation. As per 2011 census the population census of Perandoor South catchment and of Chilavanoor South is 67484, and the total projected population is 87326nos. The estimated sewer load for Perandoor canal and Chilavanoor canal is 16.033 MLD. Provision for 14651nos of households is included in the estimate.

There is an existing sewerage scheme in Zone 4 IURWTS Project. The STP is owned by KWA which is to be upgraded with the enhanced capacity 17.5 MLD. Hence a new sewerage scheme is proposed to cover the catchment area which comprises sewer network, Manholes, lifting manholes, and a sewage treatment plant of sufficient capacity, location of which is identified at Elamkulam at the nearby Chilavanoor Canal.

Actual treatment capacity of Elamkulam is 17.5 MLD including sewer load in the left out portions of IURWTS project area, which is included in KWA area. The sharing of area between KWA and KMRL is finalized and as shown in **Table 1**.

Consultant: 	DPR: Sewer network & Elamkulam 17.5 MLD STP	Project: IURWTS	Client: 
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6.3 Survey and Investigation

6.3.1 LiDAR survey

LiDAR survey was undertaken in an Area of Interest (125m on either sides from the centreline of the canal) and the control points were established through topographical survey using RTK DGPS at regular interval along the corridor in the catchment. The STP site at Perandoor falls in this corridor. The contours generated at 0.25m interval is as given in **Figure 17**.

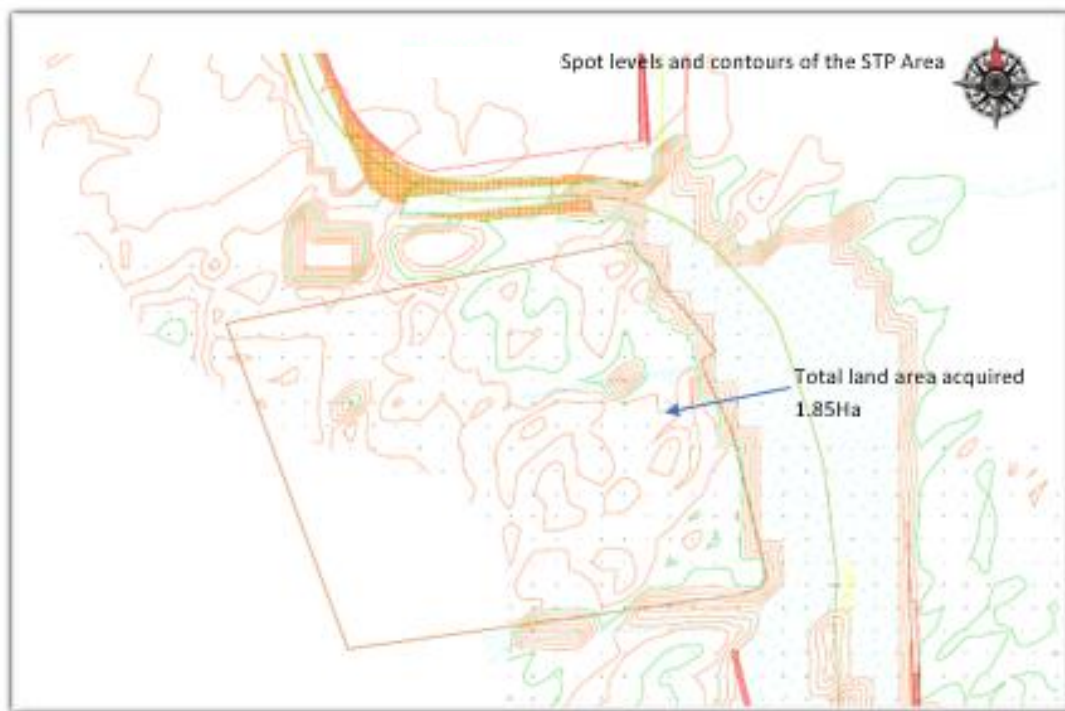




Figure 17: LiDAR survey showing the contours at Elamkulam STP location

6.3.2 Sullage water Quality

Sullage water samples from the all the canals were taken and parameters like BOD, COD, TSS, Total nitrogen etc were analysed. The water quality test results is given as **Annexure 2**.

6.3.3 Ground water table and its seasonal variation

The ground water levels were procured from the State Ground Water department in 2020 for both open wells and tube wells and the water level details are as given in **Annexure 3**. The water level ranges from 1-13m.

Consultant:  anteagroup	DPR: Sewer network & Elamkulam 17.5 MLD STP	Project: IURWTS	Client: 
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6.3.4 Geotechnical investigation

Geotechnical investigation was undertaken at the Elamkulam STP site, and the bore log details summary is given as **Table 18** and is detailed in **Annexure 4**. The foundation for the STP site was designed based on the bore log details and also the safe bearing capacity and other soil parameters estimated.

The STP at Elamkulam is proposed to treat the sewage load generated in the Southern catchment area of Perandoor canal, having a south-north flow direction bordering Banerji Road along Kochi Metro route at the southern side of the catchment. The scheme capacity is decided based on the following factors.

Table 18: Geotechnical Investigation at Chilavanoor STP location

Sl. No	Borehole Number	Coordinates		Ground Level	Location
		Easting, m	Northing, m		
1	CLC LBH-03	642157.00	1106411.00	1.833	National Public School
2	CLC LBH-04	642340.00	1105651.00	2.177	JLN Metro Station
3	CLC LBH-05	642413.70	1105441.00	2.265	Stadium Complex Road
4	CLC LBH-06	642524.00	1105206.00	2.54	JLN Stadium
5	CLC LBH-08	642629.00	1104858.00	1.388	Stadium Link Road
6	CLC LBH-09	642681.00	1104529.00	1.588	Vyloppillee Road
7	CLC LBH-10	642820.00	1103921.00	1.365	Kathrukadavu
8	CLC LBH-11	642229.00	1103634.00	2.31	Railway Quarters
9	CLC LBH-12	642809.00	1103307.00	1.909	Rail Nagar Bridge I
10	CLC LBH-13	642914.00	1103274.00	1.31	Rail Nagar Bridge II
11	CLC LBH-15	643196.00	1102662.00	2.22	Subhash Chandra Bose Road
12	CLC LBH-16	643468.00	1102103.00	1.865	Elamkulam Metro Station
13	CLC LBH-17	643850.00	1100644.00	1.353	Chilavanoor
14	CLC LBH-18	641983.00	1107291.00	2.004	BTS Road
15	CLC LBH-19	642003.00	1107803.00	1.918	Edappally Raghavan Pillai Road
16	CLC LBH-20	643196.00	1102502.00	1.604	Elamkulam STP
17	CLC LBH-21	641374.00	1109136.00	0.29	Lock Gate 1

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6.4 Design Period

The design criteria to be followed for design of sewage collection, transportation and treatment system for the project are based on the recommendations laid down in the CPHEEO Manual of Sewerage and Sewage Treatment (Ministry of Urban Development, Government of India, 2013) and as per provisions laid down in the relevant I.S. codes and Consultants' past experience in related field.

Sewerage treatment plant, like Sewerage Scheme is normally designed to meet the future requirement of a stipulated design period. This period, with regard to certain components of the project, depend on their useful life or the facility for carrying out extensions whenever required, so that expenditure far ahead of its utilization is avoided and capital expenditure incurred on the project does not remain idle due to underutilization of these facilities. For the purpose of designing this system, a 30 year project period has been considered as given in **Table 19**.

Table 19: Recommended design period for sewage components

Sl. No	Component	Recommended Design Period (in years)	Remarks/ Clarification
1	Sewer Network (Gravity Collection System)	30	The system will be designed for the prospective population of 30 years, as its replacement is not possible during its use.
2	Pumping Stations (Civil Works)	30	Duplicating machinery within the Pumping Station would be easier/ cost of Civil Works would be economical if executed once for full design period.
3	Pumping Machinery	15	Life of Pumping Machinery is considered as 15 years as per practice/ guidelines
4	Conveyance System	30	Provision will be kept for the entire design period, as its' phasing/ replacement is not possible during its use
5	Sewage Treatment Plant	30	The plant will be designed in modules for immediate stage and ultimate phase
6	Effluent disposal system	30	
7	Land Acquisition	30	Land requirement will be worked out for the ultimate stage

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In this project, the sewerage scheme is designed for a period of 30 years from the base year. Hence the population is projected to the year 2055 based on the census population 2011 with the base year 2025 and the sewage load generated for the intermediate year of 2040 (after 15 years) and the ultimate year of 2055 (after 30 years) is analysed for the design of STP.

6.5 Population Projection and sewer load calculation



The design population should be estimated by paying attention to all the factors governing the future growth and development of the project area in the industrial, commercial, educational, social, and administration spheres. Special factors causing sudden immigration or influx of population should also be foreseen to the extent possible. Population census from 1971-2011 with density is shown in **Table 20**.

Table 20: T-P and Chilavanoor catchment population Census 1971-2011 with density

Corporation/ Municipality	Area (Sq. Km)	Population Census					Density/Sq. Km
		1971	1981	1991	2001	2011	2011
Kochi Corporation	94.88	439066	513249	564589	595575	633553	6672

The ward wise Sewage load Population for Elamkulam zone of IURWTS project was found out based on the population calculations in **Annexure 1** and is given in **Table 21**.

Table 21: Ward wise population and sewer load for Elamkulam Sewer zone

DIVISION / WARD	NAME	Census Population 2011	Present population 2021	Anticipated population 2025	Projected population 2040	Projected Population 2055	Sewer Load 2055 in MLD
KOCHI CORPORATION							
39	KARUKAPPILLY	3758	3985	4079	4454	4863	0.89
44	KARANAKKODAM	4958	5257	5382	5876	6415	1.18
45	THAMMANAM	2060	2184	2236	2441	2665	0.49
52	VYTTILA JANATHA	5234	5549	5681	6203	6773	1.24
53	PONNURUNNI	4914	5211	5334	5825	6359	1.17
55	GIRINAGAR	4766	5053	5173	5648	6167	1.13
56	PANAMPILLY NAGAR	6672	7075	7242	7907	8633	1.59
57	KADAVANTHRA	2929	3106	3180	3472	3791	0.70
60	PERUMANOOR	6084	6451	6603	7210	7872	1.45
62	ERNAKULAM SOUTH	1333	1414	1447	1580	1725	0.32
63	GANDHINAGAR	5930	6288	6437	7028	7874	1.41
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DIVISION / WARD	NAME	Census Population 2011	Present population 2021	Anticipated population 2025	Projected population 2040	Projected Population 2055	Sewer Load 2055 in MLD
64	KATHRIKKADAVU	10047	10653	10906	11907	13001	2.39
65	KALOOR SOUTH	6704	7109	7277	7945	8675	1.59
66	ERNAKULAM CENTRAL	2096	2223	2275	2484	2712	0.50
	TOTAL	67484	71556	73253	79980	87326	16.03

6.5.1.1 Population Projection for Elamkulam sewer covered area

Different methods are available in manuals to forecast the population of the catchment in order to assess the Sewer load catering to a specific STP. They include,

1. Arithmetic progression method
2. Geometric projection method
3. Incremental increase method
4. Growth method
5. Graphical methods

5.0 The population data as per KWA certified master plan has been used for the sewer load estimation.

6.5.1.2 Arithmetic progression method



This method is on the assumption that the population increases at a constant rate

$$dP/dt = \text{constant} = k$$

$$P_t = P_o + kt$$

Applicability

- This method is applicable to large and established cities
- It will give lower population estimates than actual values if used for small, average, and comparatively new cities.
- In this method the average increase in population per decade is calculated from the past census record. This increase is added to the present population to find out the population of the next decade.

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6.5.1.3 Incremental Increase Method

This method assumes that the growth rate is progressively increasing or decreasing.

$$P_t = P_0 + kt + \{t(t+1)/2\} * I$$

Where ,

P_t = Projected population

P_0 = Present population

K = Average increase of the decades chosen

t = time period chosen for projection

I is the incremental increase

This method is suitable,

1. To cities of moderate size and age
2. The population for a future decade is worked out by adding the mean arithmetic increase to the last known population as in the arithmetic increase method, and to this is added the average of incremental increase.

6.5.1.4 Geometric projection method

In this method, the percentage increase is assumed as the rate of growth and the average of the percentage increase is used to determine the increment in future population. This method gives a much higher value and is applicable to growing towns and cities having a vast scope of expansion.

6.5.1.5 Growth method



In this method, it is assumed that the rate of percentage increase decreases, and the average decrease in the rate of growth is calculated. The percentage increase is modified by deducting the decrease in the rate of growth. This method is applicable only to those cases where the rate of growth of population shows a downward trend.

6.5.1.6 Graphical methods

There are two methods: in the first method, only the city in question is considered; and in the second method, other similar cities are taken into account.

6.3.6.6.1 Graphical method based on single city

In this method, the population curve of the city (i.e., the population vs. past decades) is smoothly extended for obtaining values for the future. The curve should be extended carefully; this requires

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vast experience and good judgement. The line of best fit may be obtained by the method of least squares.

6.3.6.6.2 Graphical method based on cities with similar growth pattern

In this method, the city in question is compared with other cities that have already undergone the same phases of development, which the city in question is likely to undergo. Based on this comparison, a graph of populations versus decades is plotted and extrapolated.

Population projection for IURWTS Project command - Population projection for Corporation/Municipal catchment coming under this project is based on Kochi Master Plan of KWA and is attached as **Annexure 1**. In this, the projection done by Geometric projection method. The base year is taken as 2025.



6.6 Design Criteria for STP

We need an STPs that achieve,

- the desired results on a consistent and sustained basis.
- Is robust and reliable and lasts for at least 10-15 years without major repairs.
- Needs minimum amounts of money, energy, and chemicals to achieve the desired treated water quality.
- Is easy to operate and maintain.

Table 22 illustrates the quality of water obtainable from a well-designed, engineered, and operated STP at very affordable treatment costs.

Table 22: Parametric standards generally followed for effluent water from STP



Parameters	In raw sewage	After treatment	What it means
pH	6.5-7.5	6.5-7.5	The acidity/alkalinity balance is not affected/altered.
BOD	200- 250 mg/L	< 10 mg/L	Normally, the biodegradable material in the sewage consumes oxygen when it degrades. If this sewage is released in lakes/ivers, it would draw naturally dissolved oxygen from water, depleting the oxygen in the lake/river. This causes death of fish and plants. But the STP provides enough oxygen to digest the biodegradable material in sewage. The treated sewage does not need oxygen any longer. Thus it does not affect the aquatic life in lakes and rivers
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Parameters	In raw sewage	After treatment	What it means
Turbidity	Not specified	< 10 NTU	The outgoing treated sewage has low turbidity (suspended particles that cloud the water). In other words, we get “clear” water. This prevents the pipelines from getting clogged by settled sediments. If cloudy water can reach the lakes and rivers, it blocks the sunlight from reaching the bottom of the water body. This stops the photosynthesis process of the aquatic plants, killing them. That in turns stops generation of oxygen as a by-product of the photosynthesis process. Depletion of dissolved oxygen in water kills all fish. Thus low turbidity in discharge water ultimately sustains aquatic life in lakes and rivers.
E. Coli	Not specified	NIL	The STP removes the harmful bacteria completely.

The wastewater from toilets is usually referred to as black water and the rest of the wastewater from all other activities is referred to as grey water (CPHEOO manual, Chapter:5).

6.7 Elamkulam STP (17.50 MLD)

The ward/Area/Density for the Corporation and municipality area coming under the Elamkulam Sewer network is given in **Table 21**. The trunk main, Lift manhole locations, block boundary of TP and Chilavanoor canals along with the Elamkulam STP location is given in **Figure 18** and the sub catchment representing TP and Chilavanoor canals in the Southern stretch is given in **Figure 19**.

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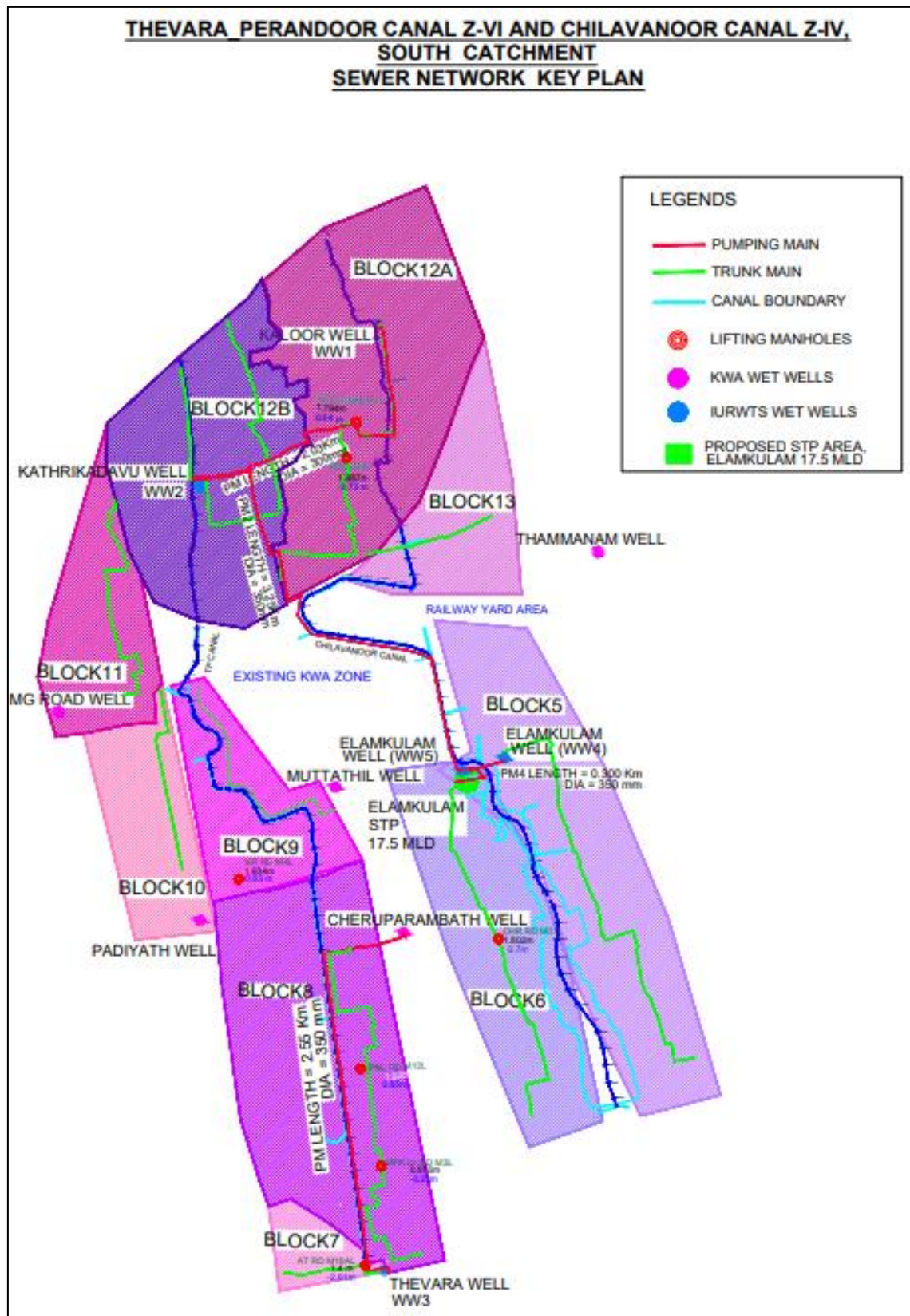


Figure 18: Block Boundary, Trunk main and Elamkulam STP location

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Project:

IURWTS

Client:



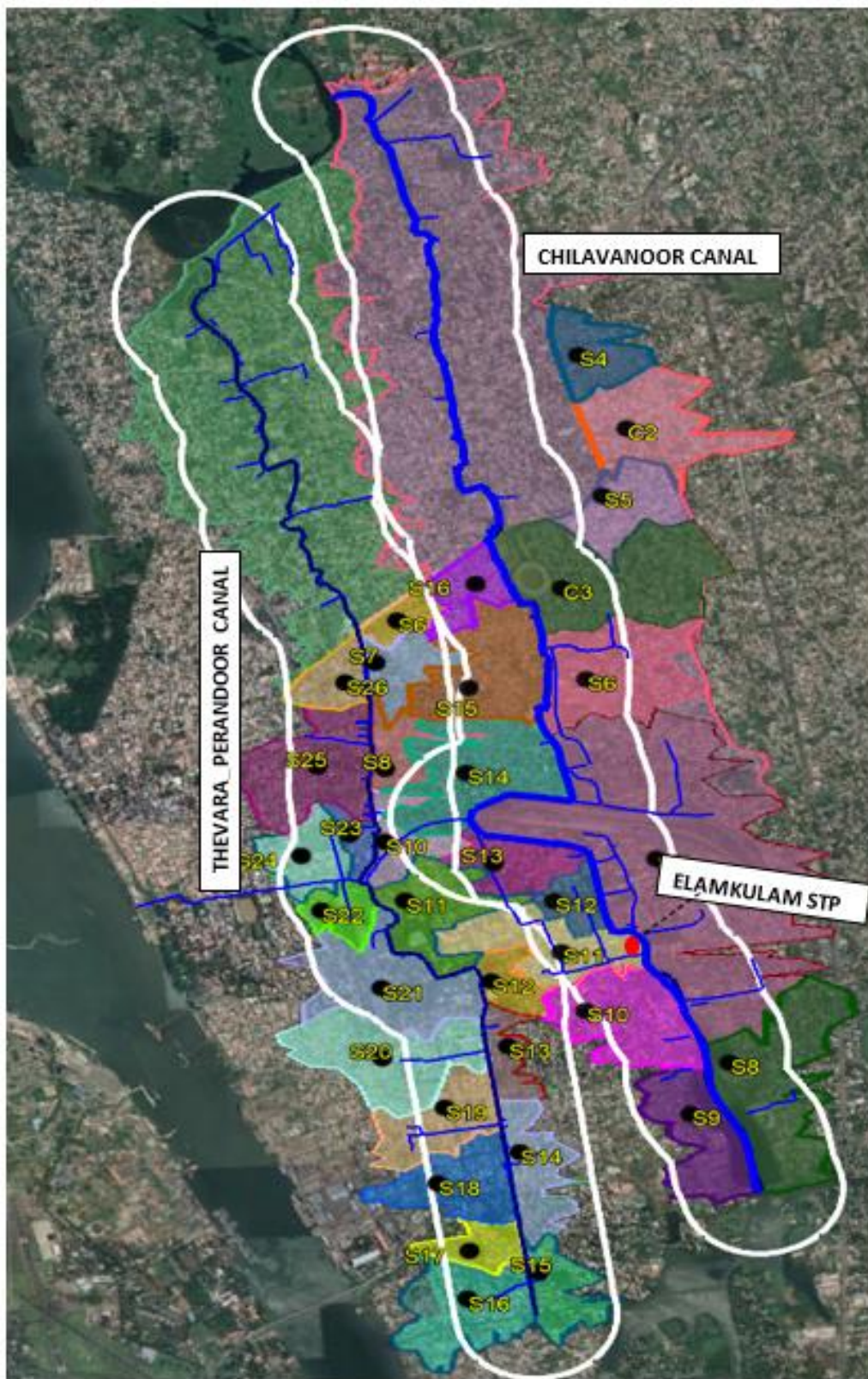




Figure 19: Elamkulam STP- TP and Chilavanoor canal South catchment

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6.7.1 Per Capita Sewage Flow

CPHEEO Manual on Sewerage and Sewage Treatment (2013) recommends a sewage generation of 80 - 90% of water supply.

The present per capita supply of water in the project area is for domestic demand is taken as 150 lpcd. Floating population is also taken into account for calculating sewer loads. For Kochi floating population considered as 55 % of the total population and for Kalamassery floating population is considered as 20% of the total Kalamassery population. So, the per capita sewage flow for floating population is taken as 70 lpcd. Sewer load for nondomestic demand is also calculated.

6.7.2 Peak Factor

The peak factor, i.e. the ratio of maximum to average hourly flow, depends on the water use habit of the population of the project area and the contributing population. The quantity of water used in a day varies during the hours of the day due to habits of people.

Though the sewerage system will receive flow throughout the day, there will be some duration in which maximum sewage will be generated.



Peak factors for domestic flow as per guidelines given in the CPHEEO Manual are as follows:

Contributing Population	Peak Factor
Up to 20,000	3.00
From 20,000 to 50,000	2.50
50,000 – 750,000	2.25
Above 750,000	2.00

The peak factor for this project sewerage system is taken as 2.25 based on the Kochi city and Kalamassery population.

6.7.3 Infiltration

The infiltration into sewerage system shall be considered during flow estimation. Estimation of the flow in sanitary sewer includes flows due to infiltration of water through the joints of pipes and through manholes. The quantity is contingent on the workmanship in laying of sewers and the depth of ground water table in the area. Sewers are designed for the peak discharges and provision for ground water infiltration is to be made for worst condition and conservative design. With better

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standards of workmanship and availability of watertight joints for pipes, these values may be kept at minimum.

During most periods in the year, no ground infiltration is expected due to the absence of rains. Furthermore, due to the use of better pipe materials and construction techniques, the infiltration will be minimal. Provision for infiltration shall be made in the designs of sewer network in the scheme as per recommendations of CPHEEO manual, **Table 23**.

Table 23: Recommended Infiltration rate

Norm	Minimum	Maximum
Liters/ha/day	5,000	50,000
Liters/km of sewer/day	500	5,000
Liters/day/manhole	250	500

The infiltration into sewer may occur through pipes, pipe joints, and manholes. With improved construction practices, the rate of infiltration will tend to be on the minimum, rather than on the maximum. The water table in Kochi is relatively high ((Source: Soil Investigation Report, 2009): it varies from 1.5 to 3 meters.



For the purpose of this project, an infiltration rate of 4500liters per km sewer line per day as suggested by CPHEEO has been adopted in the design.

Sewer load has been calculated for the projected population and is given in **Annexure 1**.

a) Based on the above factors the scheme capacity is calculated as follows.

Sewer load generated in the project area @ 85% of domestic water demand of 150lpcd per capita sewage flow	= 11.14 MLD
Sewer load for floating population and other institutions such as hospitals, hotels, commercial buildings, industries etc.	= 4.578 MLD
Ground water infiltration @ 4500liters/km/day	= 0.321 MLD
Total sewer load	= 16.03 MLD

In Elamkulam STP site KWA had proposals for construction of 3 STPs of treatment capacities 17.5MLD,15 MLD and 10 MLD. Since the upgradation of the existing old STP is included in the scope of IURWTS project, 17.5 MLD STP is included in this DPR.

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6.8 Process Description

The test results showing raw sewage quality in Kochi city is attached separately. It is observed that due to high infiltration, being a waterlogged area, the BOD concentration is less than the estimated BOD. However, the worst condition has to be taken into account for design purpose.

The object of sewage treatment is to stabilize decomposable organic matter present in the sewage so as to produce an effluent and sludge which can be disposed off in the environment without causing health hazards.

The treatment units & accessories consist of:

1. Inlet chamber
2. a) Mechanical Coarse screen arrangement & channel
b) Manual screen in the bypass channel
3. Mechanical Fine Screen arrangement & channel
4. Grit Chamber (Detritus Tank)
5. SBR Basins
6. Chlorine Contact Tank
7. Sludge Sump and Pump
8. Polyelectrolyte Dosing tank
9. Transformer Yard
10. DG Set house
11. Metering Room
12. SBR Air blower Room
13. MCC & Control Room
14. Laboratory
15. Office Building
16. Chlorination cum Chlorine tonner House
17. Centrifuge feed Pumphouse
18. Centrifuge House
19. Raw Sewage Pumphouse
20. Security Cabin

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The treatment process comprises of the primary treatment, Secondary treatment, and tertiary treatment. The STP of this project is designed for treatment using SBR technology for secondary treatment.

1. Primary treatment comprises of screening and grit removal,
2. Secondary or biological treatment comprises of Sequential Batch Reactors followed by dewatering and sludge thickening etc.
3. Tertiary treatment – GC has obtained the consent to establish STP at Elamkulam from Kerala State Pollution Control Board (ref. **Annexure 7**). The Board informed that the effluent should be adhere to the standards before discharging into the water bodies.
4. The effluent after SBR process will meet the standards. Hence there is no need for additional filtering units. Disinfection unit is added to the components for chlorination of the treated effluent which more than any other additional tertiary treatment which is approved by KSPCB. Hence this project didn't provide any tertiary treatment other than chlorination.

6.8.1 Process Flow Diagram

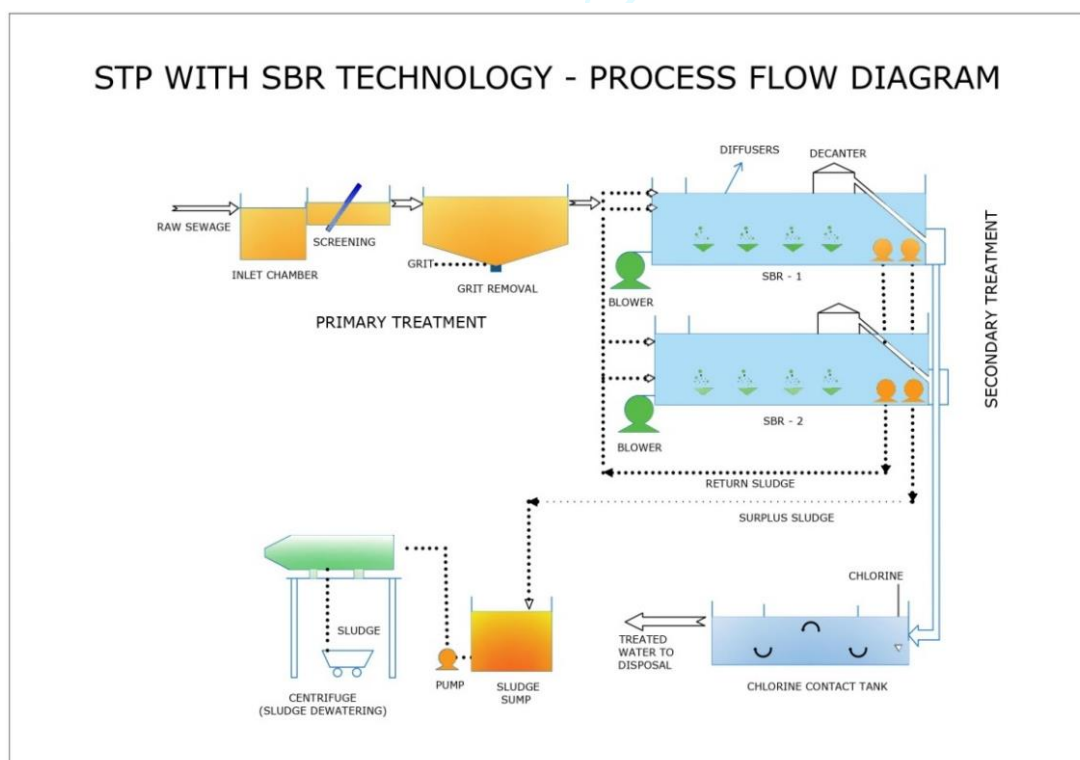




Figure 20: SBR Technology: Process Flow Diagram

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6.8.2 Primary Treatment units

The proposed primary treatment units consist of the receiving chamber, raw sewage sump (wet well) cum pumphouse, coarse screen and fine screen channels and grit chambers.

6.8.2.1 Receiving Chamber

The sewage collected through the primary sewers laid along the canal banks will collect into a receiving chamber from where it will be taken into downstream coarse screens.

6.8.2.2 Coarse screen Channel



Adequate numbers of mechanical along with manual (Stand by) coarse screens shall be provided upstream of the wet well for removal of the floating and oversized materials more than 15mm size coming with the sewage. The coarse screen shall screen out almost all of medium and large floating and oversized material such as plastic rags, debris, weeds, paper, cloth rags etc which could clog the wastewater pump impellers. The coarse screen shall be inclined bar screen of stainless steel flats and shall be sturdy design to take care of all sorts of materials envisaged in the gravity sewer. The screenings shall be dropped on a conveyor provided above the top of the screen channel. The screening materials as collected will drop automatically into a wheelbarrow for its disposal.

6.8.2.3 Raw sewage Pumping stations

Screened sewage after coarse screening enters wet well of the pumping station. The capacity of the wet well is such that adequate detention time is available during average and peak flow conditions. The effective liquid volume shall be provided below the invert level of the incoming sewer after leaving provision for free board. Also, an additional depression shall be provided to ensure adequate submergence of pumps. Pumping station shall have a room adequate for installing electrical panels. Suitable arrangement shall be provided for lifting of pumps.

Suitable combinations of submersible pumps shall be provided to cater the pumping requirements at average and peak flow conditions. Based on incoming flow conditions adequate no of pumps shall start/stop automatically as per the pumping requirements.

The pumped flow from the pumping station shall be taken to the elevated headworks, inlet chamber of the plant where sewerage will gravitate to the grit chamber.

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6.8.2.4 Stilling chamber and fine screen channels

The raw sewage is pumped from Raw water pump house collected in the Stilling Chamber shall n quiescent flow conditions. Raw Sewage then follows through Bar Screens for removal of floating matter less than 15mm and greater than 6mm. Removal of such fine particles is also required because it can also otherwise choke pipelines / pumps etc and hinders the normal operation of the treatment plant. The mechanical screen is made of steel bars and shall be of approved design, placed at equal intervals. The inclination of bars is kept such that raking becomes easy.

A manual standby screen is also provided. The screenings are conveyed through the conveyors up to the suitable loading point from where it can be transported using trolley by client. The screened sewage is now made to pass through the grit chamber.

6.8.2.5 Grit chamber



The grit present in the raw sewage may consist of sand / dirt collected during transportation the sewerage collection system. The grit removal tank removes grit and small inorganic particulate matter of specific gravity above 2.65 and particle size above 150 microns. The tank shall be RCC construction complete with mechanical internals and rectangular in shape. As the sewage is made to pass through this system the grit settles on the floor. The settled grit shall be loaded in a trolley to be provided.

6.8.3 Secondary treatment units

The main pollutants in the raw sewage are represented in the form of Bio-chemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD). The bacterial ability to synthesize the organic matter to harmless end products like carbon di-oxide and water molecules is utilized to treat the raw sewage.

6.8.3.1 SBR Process

A sequential Batch Reactor (SBR) is a fill- and draw activated sludge treatment system. As such SBRs are capable of handling all waste waters commonly treated by conventional activated sludge plants. Municipal and industrial waste waters have both been successfully treated in SBR systems. The unit processes involved in the SBR, and conventional Activated sludge systems are identical. Aeration and sedimentation /clarification are carried out in both systems. However, the important difference is that in conventional plants the processes are carried out simultaneously in separate tanks whereas in SBR the processes are carried out sequentially in the same tank.

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6.8.3.2 Process Description

A treatment plant utilising SBR concept has only one type of process unit, the batch reactor tank. It is possible and even preferable in many cases to link several identical reactors in a multiple tank configuration to limit the size of individual units and increased flexibility. There are no units dedicated to a single process, such as equalising basins, aeration chambers, and clarifiers, as in continuous flow systems. In its simplest form a batch reactor consists of a single tank equipped with an inlet for raw wastewater, air diffusers, with associated compressors and piping for aeration; a sludge draw-off mechanism at the bottom of waste sludge; a decant mechanism to remove the supernatant after settling; and a control mechanism to time and sequence the processes.



Various suppliers of SBR systems include different modifications to the basic system such as installation of a baffle near the inlet to provide a pre react chamber operated from the aerated portion of the basin. Many decant structures are marketed with features designed to limit the discharge of floating solids and settled sludge. Air diffuser design and construction also varies among suppliers, but many SBR use jet aerators or mechanical aeration to accomplish aeration and/or mixing with a single device. The heart of the SBR system is the control unit and the automatic switches and valves that sequence and time the different operations. The advent of reliable microprocessors at reasonable cost used in conjunction with modem limit /level switches and automatic valves has been a major factor in the recent development of SBR technology. The ability to control the processes in time rather than space is crucial in SBR concept.

6.8.3.3 SBR Cycle

In SBR operations the cycle processes FILL-REACT, REACT, SETTLE, DRAW are controlled by time to achieve the objectives of the operation. Each process is associated with particular reactor conditions (turbulent / quiescent, Aerobic/Anaerobic) that promote selected changes in the chemical and physical nature of wastewater. These changes lead ultimately to a fully treated effluent.

6.8.3.4 Fill or Fill-react

The purpose of FILL-REACT operation is to add substrate (Raw Wastewater) to the reactor. The addition of substrate can be controlled either by limit switches to a set volume or by a timer or a set time period. If controlled by volume, the FILL-REACT process typically allows the liquid level in the reactor to rise from 50 -80% to 100%.

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If controlled by time the FILL-REACT process normally lasts approximately 25% to 50% of the full cycle time. Period of aeration and/or mixing during FILL are critical to the development of organisms with good settling characteristics and to biological nutrient removal (Nitrogen (N), Phosphorus(P)). An advantage of SBR system of time control is its ability to modify the reactor conditions during the phases to achieve the treatment goals. This phase is ended when the liquid level in the tank reaches a predetermined level. The filling can be done in a continuous mode also.




6.8.3.5 Settle

The purpose of SETTLE is to allow solids separation to occur, providing supernatant to be discharged as effluent. In an SBR this process is normally efficient than in a continuous flow system because in the SETTLE mode the reactor contents are completely quiescent. The SETTLE process is controlled by time and is usually fixed between ½ to 1 hour so that the sludge blanket remains below the withdrawal mechanism during the next phase.

6.8.3.6 Decant/Discharge

The purpose of decant is to remove the clarified treated water from the reactor. Many types of decant mechanisms are in current use with the most popular being electromechanical moving weir type. When operated during the decant phase of the cycle the decanter travels from down at an initial fast speed. Interaction with the liquid level is detected by a level indicator float switch which then causes the decanter to proceed at its rate of travel producing a constant rate of discharge of treated effluent from the basin. On reaching designated bottom water level, the decanter is reversed to travel back to its rest position at the initial fast speed.

Sludge wasting is another important step in SBR operation that greatly affects process performance. It is not includes ass one of the three basin processes because there is no set time period within the cycle dedicated to wasting. The amount and frequency of sludge wasting is determined by process requirements, as with conventional continuous flow systems. In an SBR operation, sludge wasting usually occurs during the SETTLE or DECANT phases. A unique feature of the SBR system is that there is no need for a return activated sludge (RAS) system. Since the aeration and settling occurs in the same tank, no sludge is lost in reaction phase, and none has to be returned from clarifier to maintain sludge content in the aeration tank. This eliminates the need for the hardware and controls associated with the conventional RAS system. The sludge volume and thus sludge age in the reactor of an SBR system is controlled by sludge wasting only.

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6.8.3.7 BOD, Nitrogen and Phosphorous Removal Mechanism

Organic matter Removal

More than 95 % removal of BOD is noted in SBR. An important advantage of SBR system is the control the operator can maintain over microorganism selection. Within a complete treatment cycle the microorganism selection pressures are highly variable and severe. These pressures include Oxygen availability which ranges from anaerobic through anoxic to high DO conditions, and substrate availability which ranges from famine to feast conditions. While of certain of these selection pressures can occur in some conventional continuous flow systems, the SBR system provides the ability to easily select and extend or limit preferred conditions through time, allowing the preferential growth of desirable microorganisms. Two observations have been documented that illustrates the beneficial effects of this control ability. The first is that the RNA content of microorganisms produced in the conventional continuous flow systems. The growth rate of microorganisms has been directly linked to the RNA content of the cells. This means that in an SBR system more microorganisms are capable of processing a greater quantity of substrate at a greater rate than in a conventional system. Secondly it has been reported that a properly selected aeration strategy can result in the minimizing of the growth of filamentous microorganisms as is true in continuous flow systems. These microorganisms whose presence in quantity leads to problems with sludge bulking and foaming are undesirable in the activated sludge floc in excessive numbers and their control is an asset to system performance,

Nitrogen Removal

Nitrogen removal can be achieved in the SBR system without additional equipment or chemicals. Nitrogen enters the system in the raw wastewater in the form of organic Nitrogen and Ammonia (NH_4). It is removed from the system in the form of organic Nitrogen gas (N_2). The process by which ammonia nitrogen is converted to nitrogen gas involves three steps. First is the conversion (nitrification) of Ammonia Nitrogen to Nitrite (NO_2). Second is the conversion of nitrite to Nitrate (NO_3). Third is the conversion of (denitrification) of nitrate nitrogen to nitrogen gas. All of these steps are accomplished by microbiological action. However different nature of reactions oxidising or reducing, demands different microorganisms and reactor conditions. Nitrification, the process of converting ammonia- nitrogen through nitrite–nitrogen can only occur under conditions of adequate DO.

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In the SBR system nitrification takes place during REACT and any periods of aerated FILL. If the nitrification process is to be effective, the combined aeration time during FILL and REACT must be sufficiently long and the DO sufficiently high (greater than 1mg/l) to allow both the development of nitrifiers (those microbes performing the nitrification) in the system and the completion of Ammonia-nitrogen oxidation.

Denitrification (step3), the process of converting nitrite nitrogen to nitrogen gas, only occurs in the absence of DO. In an SBR system, denitrification can occur during the unaerated portion of FILL-REACT and during the later stages of SETTLE & DECANT after the DO content has dropped off. Recirculation of the MLSS to the selector also causes denitrification. As with nitrification, these conditions must last sufficiently long to allow the desired nitrogen reduction to take place. Nitrogen removal in SBR system can be considerably greater in efficiency than conventional continuous flow systems. The advantage of SBR system is that the conditions necessary to achieve the nitrogen removal can be created by simple changes to the plant operation (modification to periodicity and duration of aeration, providing internal recirculation) rather than by major modification of the physical plant discharge.

A selector zone is also proposed in the STP units for effective nitrogen removal.

Phosphorus Removal

Phosphorus removal by microbiological methods in SBR systems is well documented. The addition of chemical coagulant to the reactor that precipitates phosphorus into the sludge is a common phosphorus removal process applicable to both conventional continuous flow and SBR systems. The microbiological removal of phosphorus first requires an anaerobic period (The absence of dissolved oxygen and Oxidised nitrogen) during which substrate (raw waste) is present. This period should be followed by an aerobic period (high DO) that promotes the uptake of excess phosphorous by the sludge mass. Excess sludge should be removed from the reactor in suitable quantities before the onset of next anaerobic period. In term of SBR operation anaerobic conditions and aeration must be available during FILL- REACT period for phosphorous release and uptake by biomass. These conditions can also be available in selector by recirculation of sludge. The flexibility of SBR system is again shown by its ability to achieve these conditions with simple operational modifications.

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6.8.3.8 Design requirement

SBR plants typically consist of a minimum two (2) reactors in a plant. When one unit of reactors is in the fill mode, the other reactor (s) may be in the stage, the oxygen supplied to the system within the time frame of reaction cycle. This generally requires higher oxygen capacity than a continuous flow system.

In the decant stage, there shall be sufficient time to allow for mixed liquor suspended solids (MLSS) to settle before decanting begins. Due to the fact that decanting time is much shorter than fill time, the effluent flow rate will also be much higher than influent flow rate. The design of decanting weir shall be able to handle high overflow rate without affecting scouring of settled sludge. Furthermore, there shall be sufficient allowance of clear water depth from sludge blanket to minimize sludge carry over. The volume of water decanted shall be limited to prevent scouring of solids.



All SBR plants must be designed to cater for peak flows. A minimum of two (2) system is required. Proven control system in the form of Programmable Logic Controller with complete instruction is provided. All SBR systems must be preceded with complete preliminary works. The following **Table 24** highlights the key design requirements of an SBR plant.

Table 24: Key Design requirement of an SBR Plant

Parameter	Unit Values	
F/M Ratio	0.08 – 0.15	per day
Sludge Age	15-25	Days
Sludge Yield	0.6-0.8	Kg Sludge /Kg BOD Load
MLSS (End of Decant)	3000-5000	mg/L
Cycle Time	3- 8	Hours
DO (Reactor)	0 -6.5	Mg/L
Oxygen Requirement	$(\text{Cycle time/Aeration time}) \times (1.2\text{-}2 \text{ KgO}_2/\text{Kg BOD}_5 \text{ Load}) = \text{KgO}_2/\text{KgBOD}_5\text{Load}$	
Minimum settling time (Before start of Decant)	>0.6 Hr. for decant from TWL download	
Decant Depth	1.5 m Max.	
Decant Volume	Not more than 30% of volume of Reactor at TWL	
WAS	Total solids in System/ Sludge Age Kg Sludge /d	

6.8.3.9 Operation and Maintenance

The SBR typically eliminates the need for separate primary and secondary clarifiers in most municipal systems, which reduces operations and maintenance requirements. In addition, RAS

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pumps are not required. In conventional biological nutrient removal systems, anoxic basins, anoxic zone mixers, toxic basins, toxic basin aeration equipment, and internal MLSS nitrate-nitrogen recirculation pump may be necessary. With the SBR, this can be accomplished in one reactor using aeration/ mixing equipment, which will minimize operation and maintenance requirements otherwise be needed for clarifiers and pumps. Since the heart of the SBR system is the controls, automatic valves, and automatic switches, these systems may require more maintenance than a conventional activated sludge system. An increased level of sophistication usually equates to more items that can fail or require maintenance. The level of sophistication may be very advanced in larger SBR wastewater treatment plants requiring a higher level of maintenance on the automatic valves and switches.

6.8.3.10 Performance

The performance of SBRs is typically better to conventional activated sludge systems and depends on system design and site-specific criteria. Depending on their mode of operation, SBRs can achieve good BOD and nutrient removal. For SBRs, the BOD removal efficiency is generally 85 to 95%. SBR manufacturers will typically provide a process guarantee to produce an effluent of less than:



- 5 mg/L BOD
- 10 mg/L TSS
- 5-8 mg/L TN
- 1 mg/L TP

6.8.3.11 Sludge Handling System

The Sludge from the SBR process basin is withdrawn through sludge withdrawal system and collected in a sludge sump/ gravity thickener. 24 hours hold up time is provided for the tank. The sludge shall then be pumped to solid bowl centrifuge for dewatering of sludge. Centrifuge pumps shall be of positive displacement type screw pumps. Dewatering polymer shall be dosed online prior to centrifuge feed. Sludge drying beds of 3days capacity is provided as standby type.

6.8.3.12 Interconnecting Piping and Valves

All interconnecting Piping, Gates, Valves, Specials and other appurtenances, auxiliaries and accessories required as per Process Design and Scope of Work. In case of Rising Mains, thrust blocks shall be provided wherever required. In case of buried Pipes, warning tapes shall be provided of the appropriate colours.

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The material of construction for major interconnecting Piping area as follows.



Piping: Guideline for Velocity

Sl. No.	Service	Design Velocity m/s	Limitations
1	Gravity Lines for Sewage & Water	0.6 – 1.2 Designed as pipeline flowing full.	Min. Velocity shall not be less than 0.3m/sec. Max. Velocity up to 1.2 m/sec is allowable at Peak Flow.
2	Pressure Lines for Sewage & Water	0.6 – 2.5	Min. Velocity shall not be less than 0.6 m/sec. Max. Velocity up to 2.5 m/sec is allowable at Peak Flow.
3	Air (Pressurized Lines)	18 – 22	Max. Velocity shall not be more than 25 m/sec in any section.
4	Scum & Sludge Lines	0.6 – 1.5	Irrespective of flow, Diameter shall not be less than 150 mm for Gravity Lines.
5	Chemical Feed Lines	0.6 – 1.5	Irrespective of flow, Diameter shall not less than 20 mm.

Generally, the Material of Construction is selected based on the following guidelines.

Piping: Guidelines for MOC

Sl. No.	Service	Type of Flow	MOC
1	Wastewater / Sludge	Gravity	RCC NP-3 Class
2	Wastewater / Sludge	Pressurized	CI Class "LA" / DI K-9
3	Service Water	Gravity / Pressurized	GI "C" Class
4	Air Lines: Headers, Vertical Downcomers	Pressurized	Above Water: MS Sand/Shot Blasted, Epoxy Painted Under Water: SS 304
5a	Air Grid Piping: Aeration Zone	Pressurized	UPVC Schedule 40
5b	Air Grid Piping: Selector Zone	Pressurized	SS 304
6	Chemicals	Gravity / Pressurized	SS 304 except Chlorine & FeCl ₃
7	Chlorine & FeCl ₃	Gravity / Pressurized	Schedule 40 UPVC

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Valve: Guideline



Sr. No.	Service	Type	MOC	End Connection
A	Sewage / Sludge			
1	Gravity / Pressurized	Knife Gate	CI Body & SS 304 Gate & SS 410 Spindle	Flanged/Wafer
2	Delivery of Pump	Swing Check	CS Body & SS 304 Internals	Wafer
3	Suction & Delivery of Pump	Knife Gate	CI Body & SS 304 Gate & SS 410 Spindle	Flanged/Wafer
B	Service Water			
1	Gravity / Pressurized	Ball	CS Body & SS 304 Internals	Flanged/Screwed
2	Delivery of Pump	Swing Check	CS Body & SS 304 Internals	Wafer
3	Suction & Delivery of Pump	Butterfly	CI Body & SS 304 Internals	Wafer
C	Air			
1	Pressurized	Ball	CS Body & SS 304 Internals	Flanged/Screwed
2	Delivery of Blower	Swing Check	CS Body & SS 304 Internals	Wafer
3	Suction & Delivery of Blower	Butterfly	CI Body & SS 304 Internals	Flanged
D	Chemicals			
1a	Gravity / Pressurized	Ball	As per Chemical Compatibility Chart	Flanged
1b	Gravity / Pressurized	Diaphragm	As per Chemical Compatibility Chart	Flanged
1c	Gravity / Pressurized	Plug	As per Chemical Compatibility Chart	Flanged

6.8.3.13 Electrical & Instrumentation Works

Adequate incoming HT power from Kerala state Electricity Board (KSEB) based on the maximum demand load. Two nos. of Transformers (1W+1SB) for full load of the plant with 10% overload in accordance with IS 2062/1962 shall be provided for STP. Suitable cable boxes for H.T. and bus ducting for L.T. side are also to be provided.

- Substation includes 2-Pole Structure, Metering Kiosk, HT Panel, Transformers, Power Control Centre, Motor Control Centres, Earthing for Electrical equipment as well as Instruments. External Lighting etc.

The STP is proposed with provision for a fully automated system Plant including Primary Treatment Units, Biological Treatment Units based on SBR technology, Chlorination Tank and Sludge Dewatering Units through a one Programmable Logic Centre (PLC) and Supervisory Control and

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Data Acquisition (SCADA) with Man-Machine Interface (MMI). Provision shall also be made to operate each Unit of the Plant manually, if required.

6.8.3.14 PLC/PC/SCADA Based Automation System for Entire Plant

The complete Plant is proposed to be designed for automatic operation through Programmable Logic Control (PLC) and Supervisory Control and Data Acquisition (SCADA). This can be achieved by either individual equipment PLCs with SCADA/HMI or single PLC and SCADA for entire Sewage Treatment Plant. These shall be located at control room of the STP.

The plant shall have provision for operations in following modes for Automatic – Auto operation through PLC/digital controller and Manual – Operator intervention through SCADA/HMI.

Audio visual alarms shall be initiated under emergency or equipment trip conditions, other than usual service alarms.

The process system must have pre-configured software packages which can be adapted to the process by parameterization. Suitable measures is preferred by means of the installation of surge voltage arresters or surge voltage filters, to ensure that internal and external surge voltages do not impair the function of this parts of the system.

The process system (PLC, HMI/SCADA) shall be protected against power failure by an uninterruptible power supply (UPS). When the critical charge state of the UPS is reached, the process system is automatically shut down.




Mode selector switch

A mode selector switch is to be installed on the MCC or distribution board. It serves for pre-selection between Automatic mode and Manual/Local mode.

The following switching functions must be provided:

Automatic – Manual/Local

- Automatic: In this position, only automatic operation is possible; the local switches have no function (Except emergency stop).
- Local: Automatic mode cannot be started. The drives can be operated individually without interlock with the local switches.

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Local switches (LPBS)

Each drive must be equipped with a local switch positioned in such a location that the corresponding machine or conveyor can be switched on in Manual/Local mode and can be monitored visually at all times. The local switch must have the following switching functions:

START – STOP (for drives with one direction of rotation) or
FORWARD – STOP - REVERSE (for reversible drives)

- If a unit has several drives (e.g., conveyor belt drive and travel drive), the local switches should be installed if possible, in one switch box or at least installed next to one another.
- Each local switch must be adequately labeled in plain text so that no operator errors can occur.

PLC



The automatic start-up of the whole system, sequential operations and the automatic shutdown, allowing for external control influences, e.g., EMERGENCY STOP, etc., is performed by programmable logic controller (PLC). This performs not only the control of the system, but also the display of the operating state in the HMI/SCADA. The interlocks of the individual process groups and their signalling must be performed by the PLC. A system must be selected which is sufficiently protected against external interference in the supply, control and signalling lines. The aim is that the program can continue to run without fault signals in the event of transient earth faults in the supply grid. In the event of prolonged power failures, on the other hand, a controlled restart must be triggered (under-voltage trip of the non-automatic circuit breaker).

HMI/SCADA system

The HMI system shall be designed as a minimum 6", colour, touchscreen on the panel. Whereas SCADA system must be computer based, which includes all necessary functional units for parametric monitoring during Operating mode, start up and shutdown times etc.

6.8.3.15 Buildings

An administrative building will be constructed near the treatment plant to cater to all the activities pertaining to the maintenance and monitor proper functioning of the plant. A well-equipped laboratory for testing all parameters as per CPHEEO standards is proposed in the STP site in the same administrative block. Moreover, there are private and public testing facilities including Pollution Control Board laboratories are existing within the city. The Electrical HT substation to house HT Components comprising Metering Kiosk, HT Panel, Transformers and Power Control

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Centres are also proposed in the site itself. Provision for Diesel Generator to run the complete plant on full load capacity is also included in this project. Security cabin of minimum area is also proposed which is found essential for the site protection.



There is an existing access to the site at Elamkulam STP site. Provision for construction of Compound wall around the STP site with gate is also included in the project.

6.8.3.16 Foundations

Geotechnical investigation has been done for assessing the soil strata. The field and laboratory test data incorporated have been obtained and processed using procedures specified in various codes of practices, good engineering norms and conventions. The field and laboratory test results and records reported here are relevant for the test locations and time at which the tests have been conducted.

The foundation shall be designed to withstand the worst combination of loads and forces evaluated in accordance with the provisions of IS 2911. Piles transmit the load of a structure to competent subsurface strata by the resistance developed from the bearing at the toe or skin friction along the surface or both. The piles may be required to carry uplift and lateral loads besides direct vertical load. The design and construction of pile foundations may follow the guidelines provided in IS 2911. The assumption is made implicitly in the methods of analysis that are presented that high quality control and excellent construction procedures will be employed in the field. Initial, routine pile load test and other quality control during pile installation shall be carried out as per the specification presented in IS 2911 (Part 1) and / or project specifications. Reference to sub-surface soil profiles, the skin friction for the soil layers having SPT value less than 10 is not considered in total pile capacities. It is assumed that the filled material is in place for long enough and self-compaction (consolidation) is complete. The bulk density of 15 kN/m³ and angle of internal friction of 28° of filled up soil has been assumed in analysing the capacity of piles. Chances of pile squeezing due to high ground water table and sand should be considered and Integrity test to confirm the uniformity of pile diameter shall be conducted.

The type of foundation to the various plant component structures and buildings are proposed as pile foundations of adequate size and length and provision for the same is included in the estimate.

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6.8.4 General Features of STP

6.8.4.1 Location and Topography



The site for Sewage Treatment Plant is located at Elamkulam nearby Chilavanoor canal at a chainage of 9000m. It lies at latitude 90 58' 16.47" N and longitude 760 18' 23.04 E". The land is having plane topography and the ground water table is at a higher level. The bearing capacity of the soil strata is very poor. The location being a part Ernakulam District experiences more or less uniform temperature throughout the year. The major rainfall is from Southwest monsoon which contributes 63% of the annual rainfall. The new STP is proposed in KWA's own land and has an extent of 1.86 hectares. The existing corporation road STP Road/Fathima Matha Church Road in the northern side of STP site is the access to the proposed plant site.

The proposed site is the existing STP site, The units of STP are to be demolished and the site of 1.86 Ha land proposed for the construction 17.5MLD STP shall be cleared off from old STP components along with trees/bushes. Compensatory afforestation within the premises can be done which will function as a green belt for the STP.

The above land is in Survey No. 513-515 of Elamkulam Village located in Ernakulam District. The new STP is an upgradation of existing STP. The west and north borders of STP site are the two major roads of Corporation namely Subhash Chandra Bose Road and Fathima church Road. Chettithara Canal in East and south boundaries to where the treated water is allowed to draw after confirming the effluent characteristics. The existing Ground Level of the site is 2.05 m of CD and the Ground water table at a depth of 1.2m of CD below GL. There are residential buildings within the vicinity of the plant site. The old STP is functioning without any foul odour to the surroundings and no local complaints till date about the plant. The formation level of the ground shall be 2.9m. A new STP with all functional units and buildings is under construction with provision for green belt and a permanent access to the plant from Fathima Church Road is already existing.

6.8.4.2 Geotechnical Investigation

Geo-Technical Investigation has been conducted at the STP site. Average depth to hard rock is 30m from the present ground level. Laboratory tests have been conducted for undisturbed samples collected from Bore Hole No.4 for textural classification, bulk density, water content, liquid limit, compression index etc. Because of the low bearing capacity of the soil & the fact that the site is to be developed by filling 0.85m height and construction to be started immediately it may be required

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to provide under reamed compaction piles resting on hard stratum for foundations. Alternatively, consolidation of the compressible layers may be accelerated by providing stone columns or geotextiles. The detailed report with profiles of bore holes is attached as **Annexure 4**.

6.8.4.3 Water supply, electricity and sanitation arrangements

Provisions for water tank and plumbing fixtures have been provided in the estimate. It is proposed to take connection from the KWA pipeline available at the nearby road. The same will be collected in a sump and pumped to a reservoir on the service building. Power connection shall be provided by extending 11KV line up to the transformer at the STP site. There will be standby generators for power backup to guard against plant breakdown. Toilets are proposed in the plant area for use of staff & will be treated in the STP.

6.8.4.4 Solar Power Plant at STP site Elamkulam



In par with the Govt. policy to promote Green Energy and thereby to achieve Carbon Neutral , it is proposed to install 150kW, Rooftop , On -Grid, Solar Powered power plant in the proposed STP at Elamkulam. The,1500 sq. m., total area required for installing the Solar Panels are achieved by constructing a skeleton structure over the 5Mtr width Road space and super structure at the Roof Top of the SBR AIR BLOWER/ MCC & CONTROL Building . By installing this solar power plant, it is estimated as 177 Metric Tonnes of Carbon di Oxide emission per year is saved by way of producing 186000kWH units electricity worth Rs.11.25 Lakhs, annually , as per the existing Tariff structure.

a. Shadow Free Area required to mount Solar Panels

As per the standards, the minimum safety road clearance required for Fire Truck in India is 4.5mtr (width) and 5mtr (height). Baring the Chlorine prone area of the Road at Chlorination Tank premises, a skeleton superstructure having 5.5mtr width and total 210mtr. length is constructed over the Road so as to get 1155 sq. m. area for mounting the Solar Panels. In addition to this, at the Roof Top of the SBR AIR BLOWER / MCC & CONTROL Building having size 25mtr x 10mtr (total 250 sq. m.) is also proposed for mounting the Solar panels and thus totalling to 1500 sq, m., the very necessary quantity required for the 150kW Solar Project.

6.8.4.5 Statutory Approvals

Application in prescribed format with accompaniments has been submitted to the Pollution control board for their clearance as the works can be commenced only after statutory approval.

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6.8.4.6 Land transfer

The land requirement for the STP is 1.86 Ha . The new STP is proposed as an upgradation of the existing old STP of Kwa, land transfer /consent for construction only required before commencement of the work.

6.8.5 Project Implementation & Maintenance

The work of 17.5mld STP will be arranged on a DBOT mode from design to commissioning & includes a further maintenance over a period of 10 years. The time for period of completion will be 24 months inclusive of monsoon periods. SBR being a new technology, it is better to have a longer Operation and Maintenance period in the contract. The STP shall be designed based on SBR technology and the effluent quality shall be as prescribed for letting the same in the surface waters & shall cause no foul odour, undue noise etc. and shall be eco-friendly. The contractor immediately after commissioning will train the concerned staff of the corporation/KWA in maintenance. It is proposed to commission the plant by July 2024.



6.8.6 Scope

Scope of the work will include all aspects from design to commissioning & further satisfactory maintenance & will include all electrical and mechanical works including work of transformers, generators and allied items in landscaping, construction of compound walls, construction of culverts, construction of approach roads, internal roads, water supply & sanitary arrangements, sludge & effluent disposal systems. Scope also includes maintenance for a period of 10 years after commissioning.

6.8.7 Estimates



The estimate is based on per MLD rate for treatment as directed by the vetting agency, CUBE IIT.

The site for propose STP is at Elamkulam having an area of 1.86 Ha. Even though the area required for the construction of STP components is 0.72 Ha, for a healthy and hygienic environment and for future expansion of the newly constructing STP, an additional area is required surrounding the plant for providing a green belt with necessary landscaping and afforestation which is mandatory as per the norms and conditions of KSPCB and for obtaining MoEF&CC Clearances. The site is KWA's own land and new STP is an upgradation of the existing plant.

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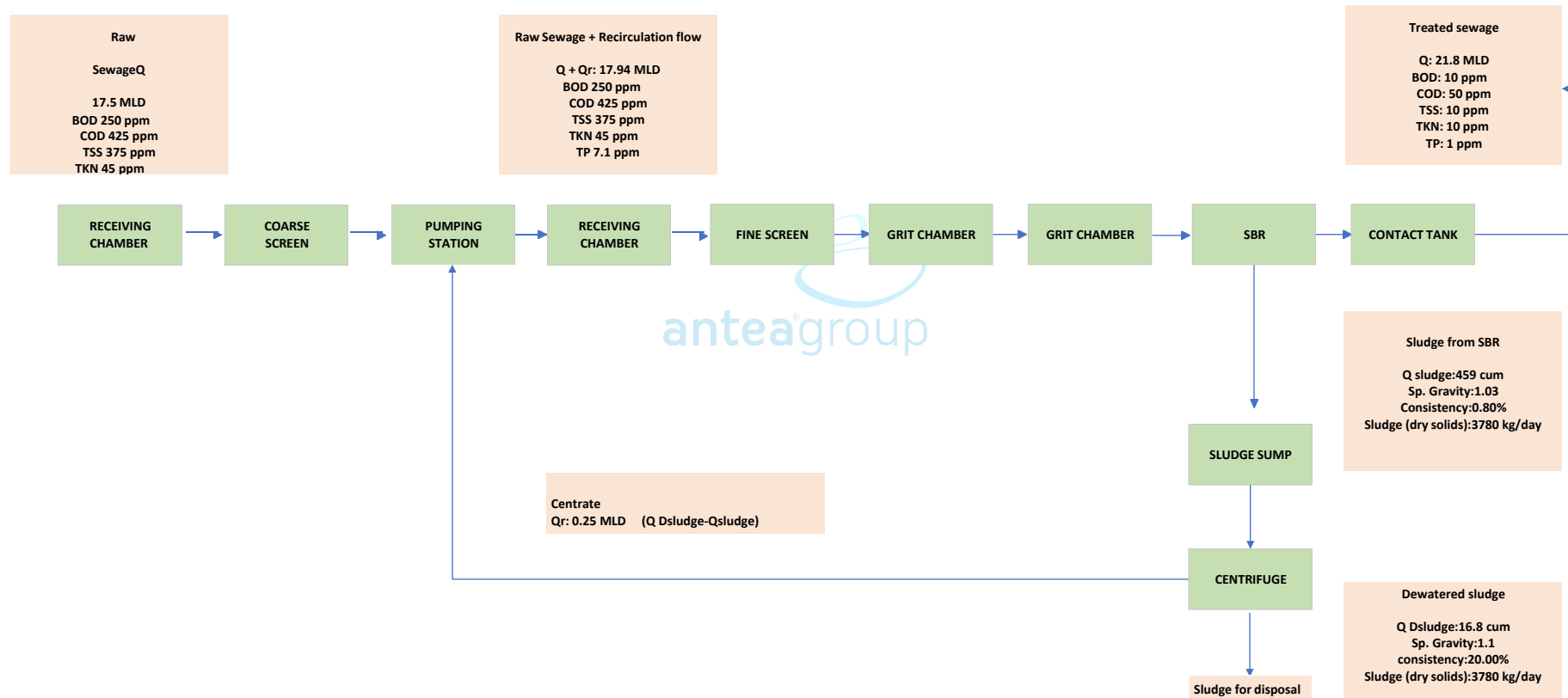
The average existing ground level of the site is +0.40CD. Since the land is water logged area, the formation level of Sewage Treatment Plant is proposed 0.85m higher than the ground level based on the flood mapping and hydraulic study undertaken. Necessary provisions for interior roads, compound wall around the site with gate is also included in the estimate. The existing KSEB line is to be extended up to the site with necessary transformer and HT installations as per standard norms and conditions of Electrical Inspectorate. All the components of STP are included in the estimate with RCC structures and pile foundation and connected works as per design drawings annexed with this DPR. A lumpsum Provision for electro-mechanical and instrumentation installations including PLC/SCADA System is also included in the estimate. The estimate also includes provision for water supply, electricity, and sanitary arrangements for the administration as well as the pumphouses and substation with all essential electrical installations. Provision for landscaping and green belt development is also included in the estimate. The estimate also envisages the operation and maintenance of all the STP components for a period of 10years from the commissioning of the STP in full form.

The estimate rates are based on PRICE data 2018 with cost index /PWD Observed data. The total estimate cost including all the components mentioned above works out to **INR 74.82 Crores** for STP **including O&M for 10 Years..** The detailed estimate is attached as **Annexure 5**.

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6.9 Mass And Water Balance for 17.5 MLD STP

WATER BALANCE FOR 17.50 MLD STP



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6.9.1 List Of Major Equipment

6.9.1.1 MECHANICAL EQUIPMENTS

Sl. No.	Name of the Unit / Equipment	Qty.	Size and other details
1.	Bar Coarse screen, Mechanical Screen	1 No. 1 No.	Material – SS 304 for wetted parts Clear Opening 20 mm
2.	Fine Screen Mechanical Screen Manual	1 Nos. 1 No	MOC: SS 304 Clear opening 6 mm.
3.	Grit Separator Mechanism	2Nos.	Type - Mechanical, complete with Classifier & organic return pump
5.	Sequential Batch Reactor	Lot	
6.	Air blowers for Bio Reactors Air Grid for SBRs	6 Nos. (4W + 2SB)	Type: Positive displacement (Twin Lobe type)
9.	Polyelectrolyte Dosing Pump	2 Nos. (1W + 1SB)	Type: metering with manual stroke adjustment Capacity: 2hp MOC: PVC / SS 316
10	Chlorine dosing system	2 Nos. (1W + 1SB)	Type: Gas chlorination, booster pumps, emergency repair kit etc.
11	Centrate Pumps	As reqd.	
12	H.O.T crane 2ton capacity	1 No	
13	Centrifuge Feed Pumps	2 Nos. (1W + 1SB)	Capacity :11m3/hr. each Type: Screw MOC: CI IS 210 Gr. FG 260
14	Centrifuge	2 Nos. (1W + 1SB)	Qty: 2 nos. Capacity: 11m3/hr. MOC: Wetted parts in SS304
15.	Interconnecting Piping and Valves		

a. Pipes

Sl. No.	Service	Type of Flow	MOC
1	Wastewater / Sludge	Gravity	RCC NP-3 Class
2	Wastewater / Sludge	Pressurized	CI Class "LA" / DI K-9
3	Service Water	Gravity / Pressurized	GI "C" Class , uPVC cl 6kg/cm2
4	Air Lines: Headers, Vertical Downcomers	Pressurized	Above Water: MS Sand/Shot Blasted, Epoxy Painted Under Water: SS 304
5a	Air Grid Piping: Aeration Zone	Pressurized	UPVC Schedule 40

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a. Pipes			
Sl. No.	Service	Type of Flow	MOC
5b	Air Grid Piping: Selector Zone	Pressurized	SS 304
6	Chemicals	Gravity / Pressurized	SS 304 except Chlorine & FeCl ₃
7	Chlorine & FeCl ₃	Gravity / Pressurized	Schedule 40 UPVC

b. Valves				
Sl. No.	Service	Type	MOC	End Connection
A	Sewage / Sludge			
1	Gravity / Pressurized	Knife Gate	CI Body & SS 304 Gate & SS 410 Spindle	Flanged/Wafer
2	Delivery of Pump	Swing Check	CS Body & SS 304 Internals	Wafer
3	Suction & Delivery of Pump	Knife Gate	CI Body & SS 304 Gate & SS 410 Spindle	Flanged/Wafer
B	Service Water			
1	Gravity / Pressurized	Ball	CS Body & SS 304 Internals	Flanged/ Screwed
2	Delivery of Pump	Swing Check	CS Body & SS 304 Internals	Wafer
3	Suction & Delivery of Pump	Butterfly	CI Body & SS 304 Internals	Wafer
C	Air			
1	Pressurized	Ball	CS Body & SS 304 Internals	Flanged/ Screwed
2	Delivery of Blower	Swing Check	CS Body & SS 304 Internals	Wafer
3	Suction & Delivery of Blower	Butterfly	CI Body & SS 304 Internals	Flanged
D	Chemicals			
1a	Gravity / Pressurized	Ball	As per Chemical Compatibility Chart	Flanged
1b	Gravity / Pressurized	Diaphragm	As per Chemical Compatibility Chart	Flanged
1c	Gravity / Pressurized	Plug	As per Chemical Compatibility Chart	Flanged

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6.9.1.2 ELECTRICAL EQUIPMENTS (Major Installations)

1. The Sewage Treatment Plant will be equipped with electrical systems that are easy to maintain and effective. The following items will be provided in Sewage Treatment plant.

1. 11 KV Switchboard
2. Transformer
3. Switchboard cum MCC
4. Power and control cables
5. Electric motors
6. Earthing system
7. PF Improvement capacitors
8. DG Set
9. Illumination System
10. Area Lighting
11. Lightning Protection

6.9.1.3 LAB EQUIPMENTS

Sl. No.	Item Description	Quantity (in Nos.)
1.	Digital pH Meter	1
2.	Turbidity Meter	1
3.	Electric Hot Plate	1
4.	B.O.D Incubator	1
5.	Single Pan Balance	1
6.	Conductivity meter	1
7.	D.O. Meter	1
8.	Refrigerator	1
9.	Incubator	1
10.	Autoclave	1
11.	Centrifuge	1
12.	Microscope	1
13.	T.O.C Analyzer	1
14.	C.O.D. Apparatus	1
15.	Hot air Oven	1
16.	Muffel Furnace	1
17.	Magnetic Stirrer with hot plate	1
18.	Distillation Water Still	1
19.	Heating Mantle	1
20.	Vacuum Pump	1
21.	Hot Water Bath	1
22.	Desiccators	1

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Sl. No.	Item Description	Quantity (in Nos.)
23.	Dematerializer K-4 75/it/H	1
24.	Jar Test Apparatus	1
25.	Remi stirrers	1
26.	Physical balance	1
27.	Laboratory Glassware	Lot
28.	Laboratory Consumables	Lot
29.	Residual Chlorine Analyzer	1

6.9.1.4 INSTRUMENTATION AND COMMUNICATION

1)	Pressure Gauges		
	Purpose	:	For measurement of discharge pressure of pumps & blowers except dosing pumps
	Type	:	Bourdon's tube/ Sealed Diaphragm / Schaffer Diaphragm type as applicable
	Diameter of dial	:	100 / 150 mm.
	Numbers provided	:	Two per set of pumps / blowers
	Casing MOC	:	Die cast Aluminum.
	Mounting	:	½" NPT type.
2)	Level Controller Switch (for Raw Sewage Sump pumps, Centrifuge Feed Pumps)		
	Purpose	:	For auto on / off of pumps
	Type	:	Liquid buoyancy (hydrostatic type)
	Contact rating	:	5 A, 230 V, AC.
	No. of contacts	:	Two
	Length of SS rope	:	As required
	No. of floats	:	As required
	Numbers provided	:	As required
3)	Air Flow meter		
	Purpose	:	For measurement of air flow going to SBR
	Type	:	Bypass type Rota meter, glass tube type with orifice plate.
	MOC	:	Body in MS.
4)	Dissolved Oxygen Meter	:	Immersion Type
5)	Variable frequency Drive	:	For Blowers For Decanters

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6)	Soft Starter	:	For Blowers
7)	Decanter Level Sensor, Level Switch	:	Capacitive Type
8)	Decanter Position Sensor	:	Magnetic Limit Switch
9)	Level Transmitter, Flow transmitter	:	Ultrasonic Type
10)	Communication System (Internal Communication)	:	Suitable as required

6.9.2 Operational Requirements

6.9.2.1 Operation & Controls

The plant will be of manual with auto-interlocks through relay-based panel.

- The ON-OFF Operation of Pumps will be based on Level Transmitter/ Level switch.
- Chemical dosing rate adjustment will be by manual stroke adjustment for Dosing Pumps.
- Chlorination dosage will be adjusted manually.
- The sludge will be drained periodically by timer based operated Motorized valves.
- The ON-OFF operation of Air blowers, Sludge Centrifuge, Mixers will be manual through LPBS.



6.9.2.2 Mechanical

1	Piping	:	DI/CI/HDPE/RCC/uPVC as per relevant IS code of practice.
2	Fittings	:	These shall be fabricated from the parent pipes.
3	Flanges	:	These shall be slip-on, Class #150 FF, plate type made from IS 2062 / IS 226 plates drilled to ANSI B 16.5 Class. /BS 10 Table D
4	Fasteners	:	These shall be as per IS 1367.
5	Valves	:	Valves except for chemical service will be CI Sluice valves
6	Check valves	:	These shall be SS for wetted parts and hot dipped galvanized steel for other parts.

6.9.2.3 Electrical

Specifications and requirements of Electrical works for STP

Only superior quality Equipment, Instruments and Materials shall be used for the work and the labours/technicians employed shall have the highest quality workmanship. All relevant clauses in Indian Electricity Rules & Electricity act shall be strictly followed wherever required. The regulations and guidelines of Power Supply Licensee/KSE Board and Kerala state Electrical Inspectorate shall be strictly followed.

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All Electrical works shall be got executed by a licensed Electrical contractor of relevant grade (license issued by the Kerala state Electrical Licensing Authority).

Availing Power from Power supply licensee's (KSEB) Mains

The land has already equipped with electrical installations for the existing old STP and the newly completed Amrut STP, the new requirement of 17.5 MLD STP shall be integrated with the existing arrangements and power shall be availed from KSEB accordingly.

Metering equipment

All the metering equipment's shall be got approved by the Power supply licensee. The contractor shall arrange and be responsible for getting them tested by the Power Supply Licensee. Contractor shall submit the detailed specifications, make/model, literature (brochure) and drawings of the metering equipment's to the consultants/clients for approval before procuring the same. The material test certificate and manufacturer's test certificate for pump, motor, Starter, control panel & capacitor should be submitted to the client/consultants for clearance before despatch




Electrical Installations

All the electrical Installations shall be provided in line with IS codes.

Motors proposed to be totally enclosed, fan cooled, squirrel cage induction type with class F insulation (with temperature limited to class B insulation), suitable for required output when line voltage variation is $\pm 10\%$ and frequency variation of $\pm 3\%$ in any combination of this voltage and frequency variation, rated for 415 Volts LT 3 phase 50 Hz. The motor shall be capable of providing the required output at an ambient air temperature of 45 degree centigrade. Provision shall be given to earth the body of motor at two distinct points. Suitable thermistors shall be embedded in the motor winding for over temperature protection.

Control Panel -Among other things the MCC/Control panel shall have the following.

- One four pole draw out type ACB of suitable capacity as incomer (with Overcurrent/ Short-circuit and earth fault protection) to receive and isolate the incoming supply to the panel
- One TPN Electrolytic quality Copper or Aluminium Bus bar rated for 415 Volts, 50KA for 1 sec.

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- Feeder compartments with Starter (with associated contactors). (DOL starter is permitted only up to 10 HP motors. From 10 to 25 HP, star delta starter and beyond 25 HP Soft starters shall be provided)
- Motor protection relays with thermal overload release for each motor.
- On/Off indication lamps, control supply failed indication lamps & Hour-run meter for all motors.
- Audio visual indication with Annunciations for motor tripped, low level, high level, pump dry running (wherever applicable) and 4 numbers of spare windows.
- Control for starting 1st duty pump, 2nd duty pump, and standby pump in case duty pumps fail to start.
- Interlock to prevent 2 or more motors starting at a time.
- Interlocks to prevent main and standby motors running at a time.
- Any other interlock required for the proper operation of the plant.
- 230 V AC space heater with thermostat and 1 No. SPN MCB with contactor

An auto manual selector switch shall be provided in the control panel for each motor for selecting the mode of operation. An interlock shall be provided for the following.




A duty selection switch shall be provided in the control panel for selecting the duty of the motors as 1st duty/2nd duty & standby. An alarm & indication shall also be displayed in the panel to indicate the standby motor started and the duty motor (1st/2nd) failed to start.

Running of motor/pump without discharge of liquid shall be detected as dry running of pump and this shall be indicated in the control panel. In such a situation the motor shall be stopped after a predetermined time delay and the standby pump started automatically.

The wiring of panel shall be 660/1100 voltage grade copper wires of suitable capacity.

One no suitable required capacity Transformer is also included in the Project cost.

Rating	:	As per the power requirement
Voltage Ration & Phase	:	11000/433V, 3 phase, 4 wire earthed
Frequency	:	50 Hz
Vector Group	:	DY n11
Tapings on 11 V	:	5% to –10% in steps of 2.5% for HV
Cooling	:	Air cooled

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Winding Temperature rise	:	90° C over and above an ambient
Tap changer	:	Off load – and by changing taps on HV side with a tapping of + 5% to –
Windings	:	Copper wound
Insulation	:	Epoxy Class F

The transformer supplied shall also confirm to the specifications approved by the Kerala State Electrical Inspectorate and the Kerala State Electricity Board. This work includes supply of HT and LT XLPE insulated PVC sheathed power cable of different sizes and voltage class as required, laying & testing them as per standards and commissioning the same.



Diesel Generator Sets

A Diesel Generator Set of reputed make shall be provided for full back up power. The capacity of the set shall be so selected for starting the highest capacity motor/equipment when all other motors/equipment (except standby motors/equipment) are in service/running. An AMF panel suitable to change over the power from mains to DG set shall be included in the supply of DG sets. System earthing shall be generally as per IS: 3043.

6.10 Conclusion

Design Parameters of STP

Description	Design Parameters
Design period	The sewerage system is designed for a period of 30 years. Outfall sewer is proposed to meet the sewage flows expected in the year 2055. Hence the proposed treatment plant has also been designed to meet the requirements of year 2055.
Sewage Contribution	85% water supply including Kitchen waste
Population Forecast	Based on 2011 population census data projected to year 2055
Quantity of sewage flow	Proposed 17.50MLD STP
Design base of STP	“MANUAL ON SEWERAGE AND SEWAGE TREATMENT Published by Central Public Health Engineering and Environment Organization, Ministry of Urban Development, New Delhi has been followed.
Peak to average flow ratio	1:1.5:2.25 (Min:Avg:Peak), i.e. at peak flow the quantity arriving at Perandoor STP shall be 17.5 (IURWTS) MLD minimum 26.25MLD average and 39.375MLD peak flow.
Average Flow	26250 M ³ /day

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Sewage Characteristic	Design parameter	Value for design purpose
	5 days BOD at 20 degree C temp	250 mg/lit
	COD	425 mg/lit
	TSS	375 mg/lit
	pH	6-9
	TKN(as N)	45 mg/lit
	TP	7.1 mg/lit
	Flow	17.5 MLD Min. flow and Peak flow- 39.375MLD
Process of Sewage Treatment Plant	Sequential Batch Reactor Process Technology	
Line of Treatment	<p>Method of treatment of sewage is fairly standardized and the CPHEEO Manual describes various processes and their design criteria that may be adopted while designing SBR STP. Accordingly, the treatment process may be divided in to three parts.</p> <p>Primary Treatment Screens: – Coarse and fine screens, grit separator to remove suspended particulate matter.</p> <p>Primary settling Tanks to reduce the load on secondary treatment.</p> <p>Secondary Treatment Consisting of Sequential batch reactor (SBR).</p> <p>Sludge Treatment in SBR process the raw sewage is directly taken in SBR reactor for treatment.</p> <p>Provision of primary tanks has been taken to remove primary sludge. Digested sludge from primary settling tank and secondary sludge will be digested in digester.</p> <p>Digested excess sludge will be dried /thickened on filter press. The dried/ thickened sludge may be utilized as manure otherwise may be disposed of in land fill site</p>	
Treated Effluent Water Quality	The treated effluent from the STP must conform to effluent quality standards as detailed below:	
	Parameter	Maximum Allowed Concentration (MAC)
	COD	<=50 mg/l
	BOD	<= 5 mg/l
	TSS	<=10 mg/l
	Fecal Coliform	230 MPN/100 ml
	Total Nitrogen as N	<=10 mg/l
	Ammonia Nitrogen as N	2 mg/l
	Total Phosphorus as P	<=1 mg/l

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Other Facilities to be provided at STP	<ul style="list-style-type: none"> • Programmable Logical Controller (PLC) • Laboratory • Security room • PMCC room • Control room • Rest room • Workshop cum store • Open store yard • Covered vehicle park • Land- Scaping • Road network and street lighting • Electrical works including Diesel generator and Transformer • Pantry and facilities • Drinking water through water authority connection.
O&M	It has been proposed for 10 years of Operation and Maintenance to be included in the tender documents.
Completion period	24 months from the award of contract

SECTION III

DESIGN OF SEWER NETWORK FOR ELAMKULAM SEWER AREA

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7. Selection of appropriate Sewer network technology and distribution network

A sewerage system, or wastewater collection system, is a network of pipes, pumping stations, and appurtenances that convey sewage from its points of origin to a point of treatment and disposal.

7.1 Types of Sewer systems

The major types of sewer line networks systems include 1. Gravity sewer network. 2. Pressurised sewer network and 3) Vacuum based network.

7.1.1 Conventional gravity sewers



Conventional gravity sewers are large networks of underground pipes that convey blackwater, greywater using gravity (and pumps when necessary). As pumps may be necessary if the landscape is very flat, they are mostly found in urban areas.

The conventional gravity sewer system is designed with many branches. Typically, the network is subdivided into primary (main sewer lines), secondary and tertiary networks (networks at the neighbourhood and household level). This system is mostly found in urban areas. All sewer pipes are laid out in straight lines whenever possible and generally meet at right angles although the connection may be curved to ease the flow.

7.1.2 Pressurized sewers

Pressurized sewers or pressure sewers differ from conventional gravity collection systems because they use pumps instead of gravity to transport wastewater. The primary effluent is delivered to the collection tank by traditional gravity drainage methods where it is grinded before being transported into the pressurized system by pumps. As for central network, no gravity is required; the system can be built with only shallow trenches and relatively small-diameter pipes. It is an effective solution where conventional systems are impractical such as in rocky, hilly or densely populated areas or areas with a high groundwater table.

A typical arrangement for a network of pressurized sewers is for each connection (or small cluster of connections) to have a tank that receives wastewater by gravity. The unit is installed in a property in consultation with the owner. A small diameter discharge pipe goes from the unit

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to the pressure sewer pipe. When the tank fills to a set point, a pump within the basin injects the wastewater further into the sewer. This transfer of wastewater pressurizes the sewer as given in **Figure 21**. A small box (boundary kit) is installed just inside the property on the discharge pipe. A non-return valve (to prevent backflow from the pressure sewer) and isolation valve is housed in this kit. The unit is wired to the household power supply and controlled by a small panel located near the unit (control panel), either on a wall, fence, or pole. A *prefabricated pressure sewer unit made out of plastic for outside placement* is given in **Figure 22**. As various pumps along the length of the sewer inject sewage into the line, the wastewater is progressively moved to the treatment facility.

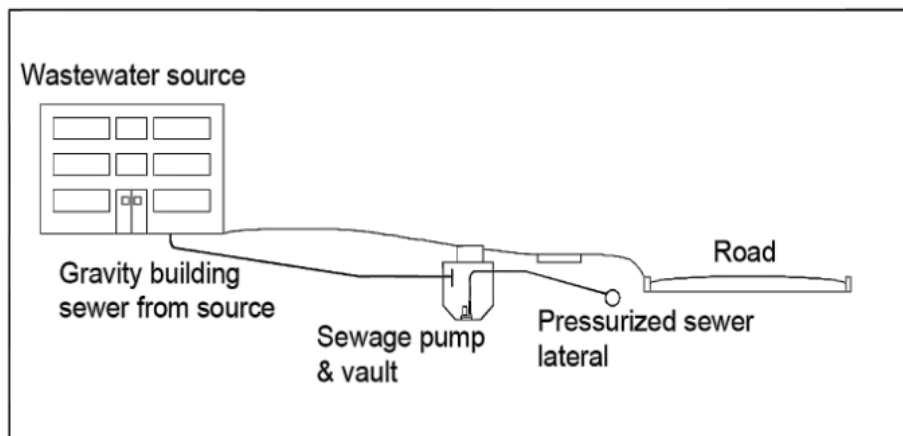


Figure 21: Schematic design of a pressurized sewer system

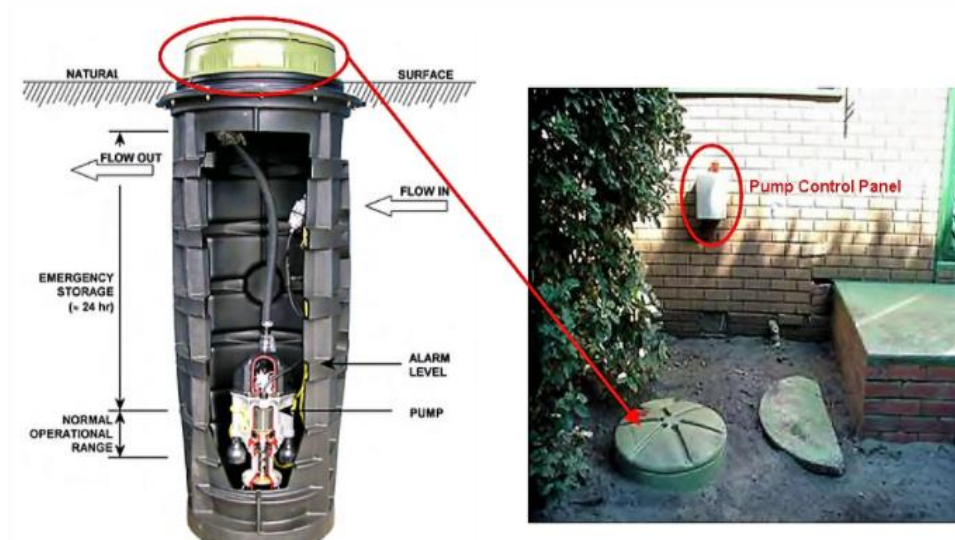


Figure 22: A prefabricated pressure sewer unit made out of plastic for outside placement

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Operation and maintenance: Regular service is important for all system components to ensure best long-term performance to protect public health and the environment. Electricity needs to be available all the time, the pumps should be checked regularly, and the pipe connections should be controlled for leakages.

7.1.3 Vacuum sewerage systems

Vacuum sewage systems consist of a vacuum station, where the vacuum is generated, the vacuum pipeline system, collection chambers with collection tanks and interface valve units forms part of it. The permanent pressure within the vacuum system is maintained below atmospheric pressure. vacuum sewers use differential air pressure (negative pressure (approximate -0.6 bar).) to move the sewage. A central source of power to operate vacuum pumps is required to maintain vacuum (negative pressure) on the collection system. The system requires a normally closed vacuum/gravity interface valve at each entry point to seal the lines so that vacuum can be maintained. These valves, located in valve pits, open when a predetermined amount of sewage accumulates in collecting sumps. The resulting differential pressure between atmosphere and vacuum becomes the driving force that propels the sewage towards the vacuum station. The hierarchy of pipes in a vacuum sewer system is given in **Figure 23** and Overview of a vacuum sewer system is given in **Figure 24**.

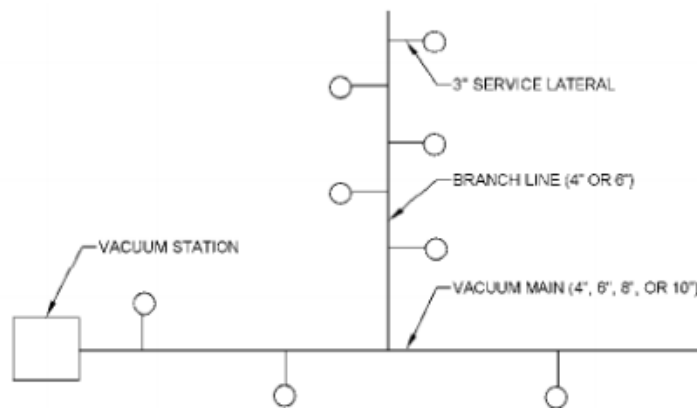




Figure 23: Hierarchy of pipes within a vacuum sewer system

Vacuum station: All the vacuum sewers are connected to the vacuum collection vessel installed at the central vacuum station, where vacuum pumps create the required negative pressure (approximate -0.6 bar). The vacuum vessel can be placed inside or buried outside the vacuum station. Transfer pumps convey the wastewater from the vessel to the wastewater treatment

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plant or to an existing sewer. The capacity and dimensions of the vacuum station are dictated by the particular requirements of the sewer system. Operation of the vacuum and transfer pumps is controlled by a software (ROEDIGER 2007). **Table 25** gives the relation between the Pipe diameters and the relation to maximum flow per minute and maximum number of served households.

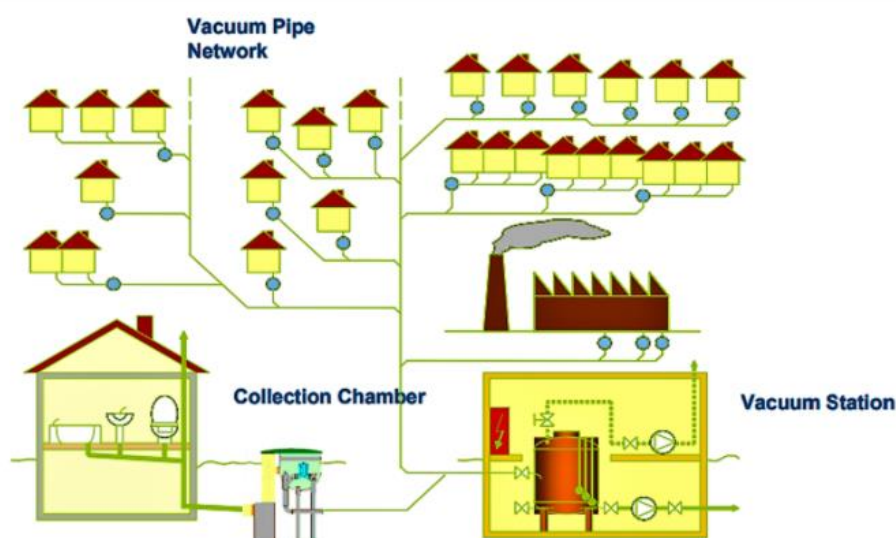


Figure 24: Overview of a vacuum sewer system.

Table 25: Relation between pipe diameter and number of households served

Pipe diameter		Max flow		Max number of houses served
Inch	Mm	GPM	L/min	#
4	101.6	55	208	70
6	152.4	150	577	260
8	203.2	305	1.155	570
10	254	545	2.063	1,050

7.2 Advantages and Disadvantages of sewer systems

The advantages and disadvantages of popular sewer systems have been documented from published literature and is detailed in the below **Table 26**.






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Table 26: Advantages and Disadvantages of sewer systems



Sl. no.	Conventional Gravity sewers (CGS)		Pressurized Sewer System (PSS)		Vacuum Sewer Systems (VSS)	
	Advantage	Disadvantage	Advantage	Disadvantage	Advantage	Disadvantage
1	Gravity flow: No pumps required	Requires deep excavations	Sewer lines laid at lesser depth	Needs expert design	Vacuum source to convey sewage from individual households to a central collection station	As it is a high-tech system, it is costly
2	Less maintenance compared to solids-free sewers	Very high capital costs	No constraints on the land topography	Grinder pumps: permanent energy source required	Pipe dimensions smaller and installation cheaper as piping is independent of topography	Increase in cost due to constant energy requirement for the permanent vacuum generation
3	Can be used as a combined sewer	A minimum velocity to prevent the deposition of solids in the sewer	Pipe size and depth requirements are reduced, and many small pumps are cheaper than a single large pump	A proper recycling of nutrients is not possible as all kinds of wastes gets mixed by grinding	Smaller depths of trench work can be done by local workers and no heavy machinery is required	The system needs specialized trained workers for maintenance and operation works
4	Can handle grit and other solids, and large volumes of flow	uniform viscosity of sewer load cannot be maintained	Requires little water only for transporting the excreta	Higher capital cost	Large amount of flushing water can be saved which is economical.	Total manhole cost in gravity system is 33percent cheaper than the total cost of the similar components in vacuum system

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Sl. no.	Conventional Gravity sewers (CGS)		Pressurized Sewer System (PSS)		Vacuum Sewer Systems (VSS)	
	Advantage	Disadvantage	Advantage	Disadvantage	Advantage	Disadvantage
5	Land acquisition for pumping systems not required	Difficult and costly to extend as a community changes and grows	PSS offers controlled transfer of sewage in a far more efficient footprint than conventional sewage systems	Unsuitability for self-help, requires skilled engineers & operators	The risk of clogging is low and there is almost no cleaning/emptying work to do.	Additional cost for vacuum valves and vacuum station
6	Lesser skilled engineers and operators compared to pressurised system	Requires expert design, construction, and maintenance	reliability and the potential to be expanded as the demand for sewage handling increases.	Leakages may lead to contaminations.	Field changes can easily be made as unforeseen underground obstacles can be avoided by going over, under or around them	Design guidelines and operation and maintenance are not well known in developing countries
7	No restrictions on connections	Leakages pose a risk of wastewater exfiltration and groundwater infiltration and are difficult to identify	Possible to install a network in rocky, hilly, coastal, or other difficult areas, such as those with high water tables where conventional gravity-fed sewers would be too costly	Land acquisition involved and land area required in individual house holds	Suitable where rock layers, running sand or a high groundwater table is encountered where deep excavation difficult	Number of system providers limited in India

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Sl. no.	Conventional Gravity sewers (CGS)		Pressurized Sewer System (PSS)		Vacuum Sewer Systems (VSS)	
	Advantage	Disadvantage	Advantage	Disadvantage	Advantage	Disadvantage
8	No risk of overflows in the neighbourhood and odour control is better.	Requires manholes to be placed at set distances and at every pipe-turn. These manholes are potential entry points for infiltration/inflow. Higher infiltration/inflow complicates treatment and increases operating and maintenance costs.	Eliminates the opportunity for any sewage or contaminated liquid to leak into the surrounding area. Odour issues are therefore dramatically reduced	Grinder pumps require power at each unit. The panel is usually installed on the side of the house and power paid by the homeowner. Existing houses may need to upgrade electrical mains and power board.	Areas short of water supply or poor communities that must pay for and cannot afford great amounts of water necessary for operation of gravity systems.	Faults at individual valves can affect the entire system
9		Gravity systems require a significant upfront investment in excavation and piping before connecting any homes to the system	Operator's advantage: ability to monitor the performance of the network performance, often remotely via the web, and capture performance data allows various parameters to be managed so that the system operates at peak efficiency	One pump is required per house. If the house is large or commercial flows anticipated, then a larger capacity pump may be required.	Areas that are ecologically sensitive, Areas where flooding can occur	System components are not readily available everywhere.

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Sl. no.	Conventional Gravity sewers (CGS)		Pressurized Sewer System (PSS)		Vacuum Sewer Systems (VSS)	
	Advantage	Disadvantage	Advantage	Disadvantage	Advantage	Disadvantage
10		Large-diameter, long-distance gravity mains can be a source of gas generation and odour	Operating periods can be programmed and staggered so that peak loads on the wider network are reduced. This feature can also help reduce or eliminate the emergency storage capacity which the network's sewage pump station might otherwise require to cope with input surges	As all pipework is under pressure then a break in the pipe will lead to large exfiltration. Not suitable in environmentally sensitive areas.	Trench filling materials cost, labour cost, dewatering and safety measure costs are also less in vacuum system compared to the similar costs for the gravity system	Due to lower transport velocities vacuum mains which have a large pipe diameter are more prone to scaling and precipitation from compounds contained in the wastewater and reduction in life span
11		Electricity required only at the Pump Station, and a number of pump stations may be required to service a single Catchment.	Remote monitoring capability also allows for the early detection of problems in the network, so that immediate action can be taken before matters escalate, thus reducing maintenance costs and network disruption	As all pipework is under pressure then a break in the pipe will lead to large exfiltration. Not suitable in environmentally sensitive areas	Overall, vacuum system is around 30 % less expensive than gravity system.	As with any sewer system, pipe cracking may occur due to land subsidence or landslide resulting in the loss of vacuum in the system

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Sl. no.	Conventional Gravity sewers (CGS)		Pressurized Sewer System (PSS)		Vacuum Sewer Systems (VSS)	
	Advantage	Disadvantage	Advantage	Disadvantage	Advantage	Disadvantage
12		A broken pipe will go unnoticed for many months and the depth of the gravity lines will make detection difficult and expensive to repair	Control network and two-way telemetry features allow multiple individual units to be linked and managed from a centralized network point	Access is difficult as all equipment is on the homeowner's property for maintenance		The time periods for the replacement of deteriorated parts and the preventive inspections are determined by the equipment manufacturer and the authorities have no control over it.
13		Broken pipe can go unrepaired for long periods allowing stormwater to enter the system. This increases Treatment costs and power use.	Offers completely 'clean' access to the motor which sits in a dry well, as opposed to being submersed in sewage in the conventional manner. This keeps the motor and electrical systems separate from the fluid being pumped, and so makes maintenance a far quicker, safer, and more pleasant process.	Operation and maintenance of pump stations, skilled workers, power usage and carbon footprint is more	Contrast to conventional gravity flow or pressured sewer systems vacuum sewers use differential air pressure to transport wastewater which is generated by vacuum pumps located at the vacuum station, a centralized unit and in most designs the only point of electricity consumption	The availability of components needs to be checked and ensured when choosing a vacuum sewer system. In the event of system failure or material wear individual parts need to be available to ensure quick recovery of the sewer function

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Sl. no.	Conventional Gravity sewers (CGS)		Pressurized Sewer System (PSS)		Vacuum Sewer Systems (VSS)	
	Advantage	Disadvantage	Advantage	Disadvantage	Advantage	Disadvantage
14		Limiting pump station compared to pressurised sewer systems reduces land cost	Smart safeguards which greatly reduce the possibility of people and pets coming into contact with the individual grinding and pumping unit.	Long term cost of a pressurised system is higher than the gravity system based on cost benefit analysis undertaken	Flood-proof – Vacuum systems can prevent flood waters entering the sewer system meaning that the sewers still operate if the area is flooded.	sufficient stock and long-term material supply need to be assured making the initial cost of construction higher.
15			Pressure sewers offer freedom from infiltration/inflow because the systems are sealed. With residential pressure sewers, the only extraneous water entry points in the system between the homes and the treatment plant are the homes.	Pump stations have multiple pumps, they have backup generators, and this makes O&M higher,	Minimum maintenance at vacuum valves and collection chamber	Operation and maintenance costs can vary significantly on how well the system is designed and how repair of the system failures is managed.
16			Pressure sewer systems control odour more effectively than gravity systems		No infiltration of stormwater or groundwater due to tight system	Vacuum stations use one vacuum pump and one sewage pump, and both have a spare one in case of failure or service

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Sl. no.	Conventional Gravity sewers (CGS)		Pressurized Sewer System (PSS)		Vacuum Sewer Systems (VSS)	
	Advantage	Disadvantage	Advantage	Disadvantage	Advantage	Disadvantage
17			As it is a pressurized system infiltration cannot occur		No manholes required	The number of vacuum stations required for a large system is very high and the land cost for installation depends on site specific conditions.
18					Vacuum sewer systems are the only systems allowed to be installed in ecologically sensitive areas a	⁹ Studies in Germany bring out electricity consumption of vacuum sewers is about 15-30kWh/person/Year and 0.2 – 0.7 kWh / m ³ wastewater
19					Minimum impact to the environment from construction	¹⁰ Vacuum systems are also called alternate connection systems (ACS). communities of 3,500-10,000 population can likely provide a sustainable and effective management program for any ACS technology

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Recommendation



Based on the advantages and disadvantages analysed a combination of gravity system and pressurised system for primary network has been adopted for IURWTS catchment. As far as possible gravity system was adopted with one or two trunk mains for conveying and collection the sewer load to the receiving chamber of STP. This concept minimized the pumping stations and thereby reducing the Land Acquisition cost. The topography is conducive for a gravity system inside the catchment and no land acquisition is required as the alignment follows the road networks. Vacuum sewer system is not recommended considering the shortage of skilled and trained workers for the operation and maintenance, land cost involved for setting up vacuum stations, Continuous energy requirement, Number of system providers limited in India. Faults at individual valves can affect the entire system, deteriorated parts and the preventive inspections are determined by the equipment manufacturer and the authorities have no control over the time for replacement.

Based on the advantages and disadvantages analysed a combination of gravity system and pressurised system for primary network has been adopted for IURWTS catchment.

7.3 Network Patterns of collecting system

7.3.1 Perpendicular pattern

In this pattern sewers carrying storm water are laid in such a way as to seek the shortest possible path to the natural water courses. The shortest possible path to the natural water courses can be obtained if the sewers are laid perpendicular to them. This pattern is suitable for separate system and partially separate system in which storm water can be directly disposed of without any treatment as given in **Figure 25**. It is not suitable for combined system, because firstly it is very difficult to treat the sewage due to large number of outlets and secondly it pollutes the water of natural courses.

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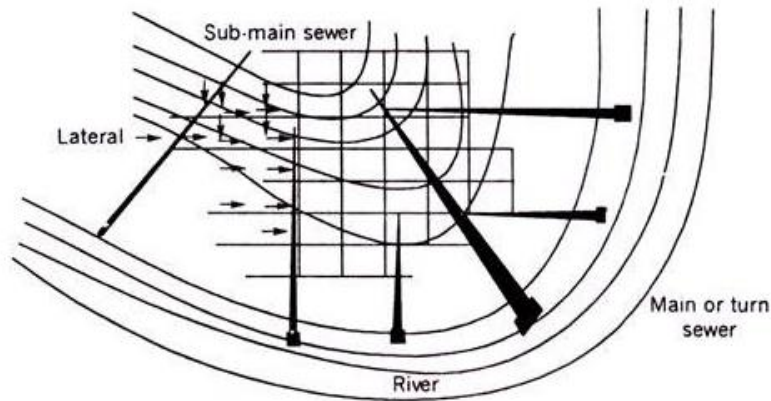


Figure 25: Perpendicular pattern

7.3.2 Interceptor pattern

This pattern is an improvement over the perpendicular pattern. In this pattern sewers are intercepted by a large size sewer, which is laid all along the water carrying sewage to a common point, where it can be disposed of with or without treatment. If the quantity of storm water is very large, overflows should be provided as shown in **Figure 26**. allowing the excessive sewage to spill over into natural water courses through outlets, which were existing before the interception.

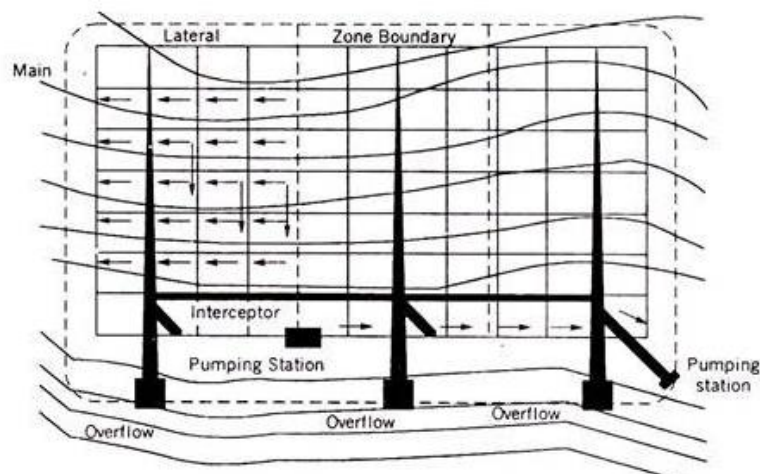


Figure 26: Interceptor pattern

7.3.3 Radial pattern

This type of pattern can be employed if the sewage is to be disposed off on land around the town. In this pattern large number of outlets are provided. The sewers are laid radially outwards from the centre of the city; therefore, this is called as radial pattern as given in **Figure 27**. In this

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pattern the suburbs can be served by relatively small and short lines of sewers which make it economical. The main disadvantage of this system being large number of disposal works.

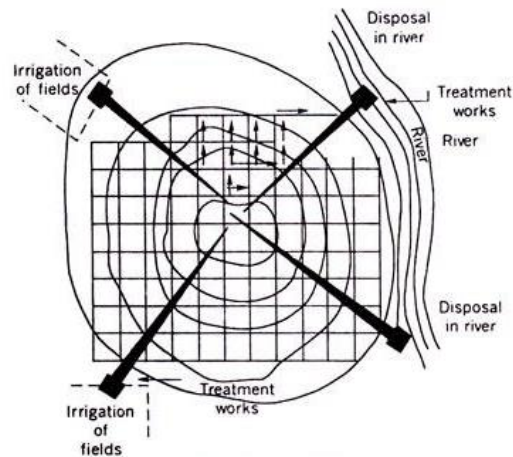


Figure 27: Radial pattern

7.3.4 Fan Pattern

If the city is situated near the river, which is on one side of it only, the sewer can be laid in such a way that the whole sewage flows to a common point where one treatment plant is located and is given in **Figure 28**. In this pattern number of converging main sewers are laid, which form a fanlike shape, from which it derives its name.

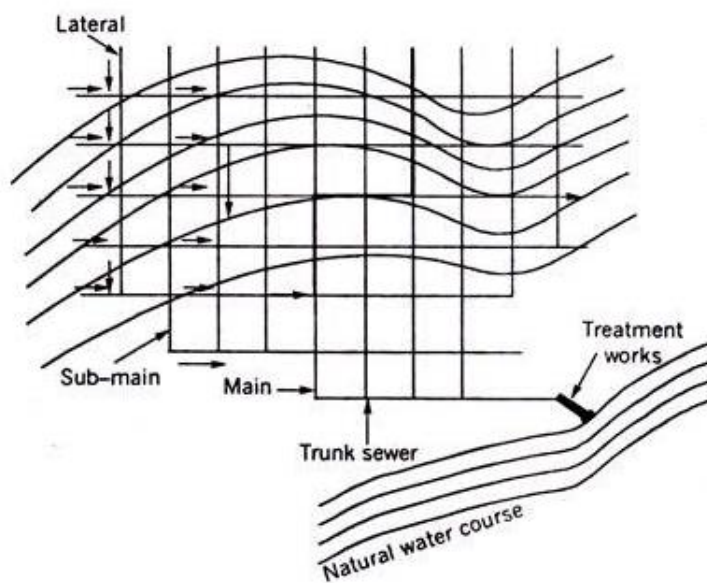


Figure 28: Fan Pattern

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7.3.5 Zone pattern

In the interceptor pattern only one single large size intercepting sewer is used to collect and convey the entire sewage, due to which it is over-loaded. This over-loading can be removed by providing more number of interceptors of each zone as shown in **Figure 29**. This type of pattern is most suited to sloppy areas as hills than flat areas.

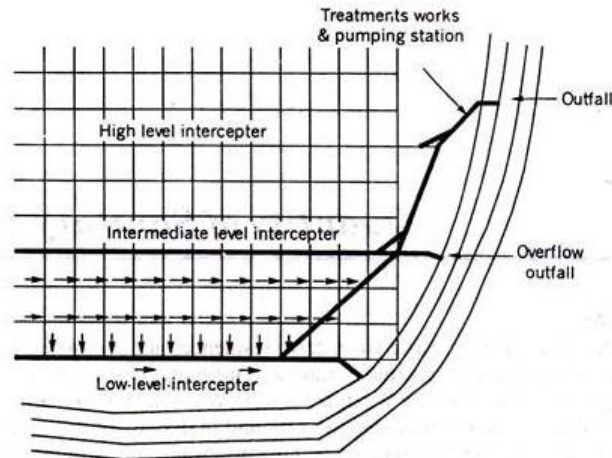




Figure 29: Zone pattern

The pattern adopted for IURWTS catchment is a fan pattern as the flow from the catchment flows by gravity system to a common trunk main up to the STP site Sewerage plan for IURWTS Elamkulam sewer area.

The pattern adopted for IURWTS catchment is a fan pattern as the flow from the catchment flows by gravity system to a common trunk main up to the Collection well/STP site Sewerage plan for IURWTS Edappally and Chilavanoor canal North Catchment.

Sewerage scheme for Elamkulam Sewer area is designed for DWF (Dry Weather Flow) i.e. designed as separate system and not as combined system for Techno- economic reasons. The CPHEEO guidelines manual on Sewerage and Sewage Treatment published by the Ministry of Urban affairs as practiced in India is followed. There is no existing sewerage system or treatment plant in Elamkulam sewer area.

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Stages involved in planning a sewerage system

There are four stages in the entire sewerage system as follows.

- a) Collection of Sewage (Sewers & Sewage Pumping Stations)
- b) Transportation of Sewage
- c) Treatment of Sewage – Sewage Treatment Plant
- d) Effluent Disposal System

The proposed project aims to provide a comprehensive wastewater collection, treatment & disposal system using laterals, branches and trunk mains including sewage treatment plant south catchments of Chilavanoor and Thevara Perandoor Canal with STP located at Elamkulam, with minimum disturbance to the urban fabric of the catchment.

7.3.6 Planning Strategy for laying of sewerage network



This DPR deals with household sewer network connectivity of the sewer area of Elamkulam sewer area which consists of south catchment areas of Thevara Perandoor canal and Chilavanoor Canal. The treatment of sewage load generated is proposed at the STP at Elamkulam as explained in previous sections of this report.

The Chilavanoor canal south catchment has Kochi Corporation division on either side. The sewer load from all the above areas is proposed to convey to STP at Elamkulam either by gravity system or by pumping system whichever is feasible.

As regard to the tertiary network most of the roads are narrow and the sewer lines proposed is through the centre of the road and where the roads are wide the tertiary and secondary sewer lines are proposed on the berm sides of the road network, so as to help in connecting houses on both sides of the road to the tertiary networks.

7.3.6.1 Base Map Preparation

The planning of the sewerage system in catchment forming part of the IURWTS project was undertaken using the following Secondary and primary data.

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- a. Survey of India Topographical Map Sheet No scale 1: 50,000 (58 C5/C1)
- b. Secondary data of Road network and elevation based on topographical map obtained from KMRL with 0.50m contour interval.
- c. Ward maps with population data obtained from Kochi corporation and municipalities.
- d. Topographical spot level survey of road elevations undertaken by GC for missing links.
- e. LiDAR data with contour interval of 0.25m in a corridor of 250m on either side of canal.
- f. Topographical survey of Sub drains with cross section undertaken by GC reaching canal.
- g. Fixing benchmarks and control points in the catchment.
- h. Google map

7.3.6.2 Design Software adopted



Computer aided MS Excel sheet as per CPHEEO manual procedure has been used for Sewer network design. Considering the topography of IURWTS South Catchment and the limited flexibility in use of Sewer CAD, only validation works have been undertaken for selected pockets using Sewer CAD/SWMM.

7.3.6.3 Block wise demarcation of Corporation/Municipal area

Looking to the topography, construction scheduling and development trend the total area of south catchment of TP and Chilavanoor of IURWTS project has been demarcated as 9 blocks. This is to construct a comprehensive sewerage system for TP and Chilavanoor southern catchments for the STP identified at Elamkulam near Chilavanoor canal for final disposal of the treated effluent which is proposed to be treated at STPs based on SBR Technology. The STP technology is being selected primarily taking into consideration less land requirement and to have effluent characteristics as per MOEF/ CPHEEO, and after undertaking a parametric analysis of the different technologies in vogue so that treated water can be reuse or discharged into inland water ways adheres to the standards. The land made available for STP of 1.86 acres is sufficient for ultimate design flow.

Blocks are uniquely numbered for IURWTS zones. Block 1 for Perandoor Bock, 2,3 and 4 for Muttar sewer blocks, Elamkulam Sewer blocks starts from 5 to 13 as shown in **Figure 30**.

Out of 9 blocks thus arrived in the early DPR which is increased to 10 Nos in the revised one, sewer load generated in the blocks 5 and 6, is directly conveying to STP through trunk mains.

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Sewer load from KWA is considered in designing block 5 in the respective manholes informed by KWA.

Block 5 – This block consists of the area covered in the southeast and opposite to the STP site which is the southern part of Chilavanoor catchment. The sewer load in this block is proposed to be conveyed through trunk main of suitable size to the newly proposed well at SC Bose Road STP site of KWA.

Block 6- This block area covers the South west of Chilavanoor south Catchment area and is directly collected in the propose well at STP site by gravity.



Block 7 Theis block is the western part of Thevara Perandoor Canal South Catchment . The sewer load collected in the newly proposed collection wet well at Thevara which is then added up with KWA load and is pumping to the new well at Cheruparambathu well-proposed by KWA which is then pumping to STP for treatment.

Block 8 – The block 8 covers east side of the Thevara-Perandoor south catchment area and the generated sewer load is conveyed to nearby Manhole of KWA which is the n directed to Cheruparambathu well and then to STP

Block 9- The area surrounding the network of existing Muttathil line Collection well of KWA , covering the most of central portion of TP Canal south catchment. The sewer load is collected din nearby manhole of KWA which is then connecting to the existing KWA well at Muttathil line and then pumping to STP for treatment.

Block 10 The area under this block consists of west side of TP Canal and the area lies between Railway line and TP canal. The sewer load generated in this area is directed into one of the KWA manhole which is then conveyed to newly proposed KWA collection well at Padiyath.

Block 11- The area consists of the surrounding area in western side of south railway and nearby the existing KWA sewer network, collecting in the KWA manhole and then to the existing KWA collection well at MG Road. Similarly in designing block 11 also, sewer load of KWA is considered in designing the network to reach up to the existing MG road well cum pumping station which is then pumping to STP through the existing pumping main.

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In the revised design by CUBE, the Block 12 is divided into Block 12 A and Block 12 B. The sewer load generated in Block 12 A collected in Wet well WW1 located at Kaloor , the new well proposed by KMRL in the KWA own land and is conveyed and collected in the newly proposed Kathrikkadavu well WW2 in block 12 B at Chainage of 4500 of TP Canal and is then pumping to STP at Elamkulam.

Block 13 – the east side of Chilavanoor canal includes in Block 13 and is collected in the KWA Manhole and is then conveyed and collected in the newly proposed KWA collection well at Thammanam and then pumping to STP for treatment.



Sewer network for block is designed as gravity sewer system. In the design of gravity sewer system, the important decisions to be taken are location, size, slope, and depth of sewer, material of sewer lines and appurtenances to be added such as manholes, junctions, vent pipes and other structures to minimize turbulence, save head loss and prevent deposits and obnoxious gases.

This is to maintain a gravity flow in the sewer system and to eliminate pumping station inside the sewer network catchment before the flow meets the STP site. By way of eliminating pumping stations inside the catchment, the public woes on account of menace caused due to foul smell and environmental pollution will be addressed. Elamkulam zone has now 9 pumping stations shared by KWA including the existing ones to avoid practical difficulties of road/railway crossing by using Gravity mains.

7.3.6.4 Block wise Population projection and real extent in Elamkulam Zone

The ward Map coming under Thevara-Perandoor canal and Chilavanoor canal south catchment were superimposed onto the catchment area map and the shape area of the ward falling inside the catchment was estimated on a GIS platform. The proportionate population for the ward area coming under the catchment was also estimated based on census data for the year 2011 and projected data for the year 2055 and according to the Kochi Master plan of KWA and is given in **Table 21** of this report.

Further the shape area of the ward coming under the demarcated blocks and sub basins was estimated on a GIS platform.

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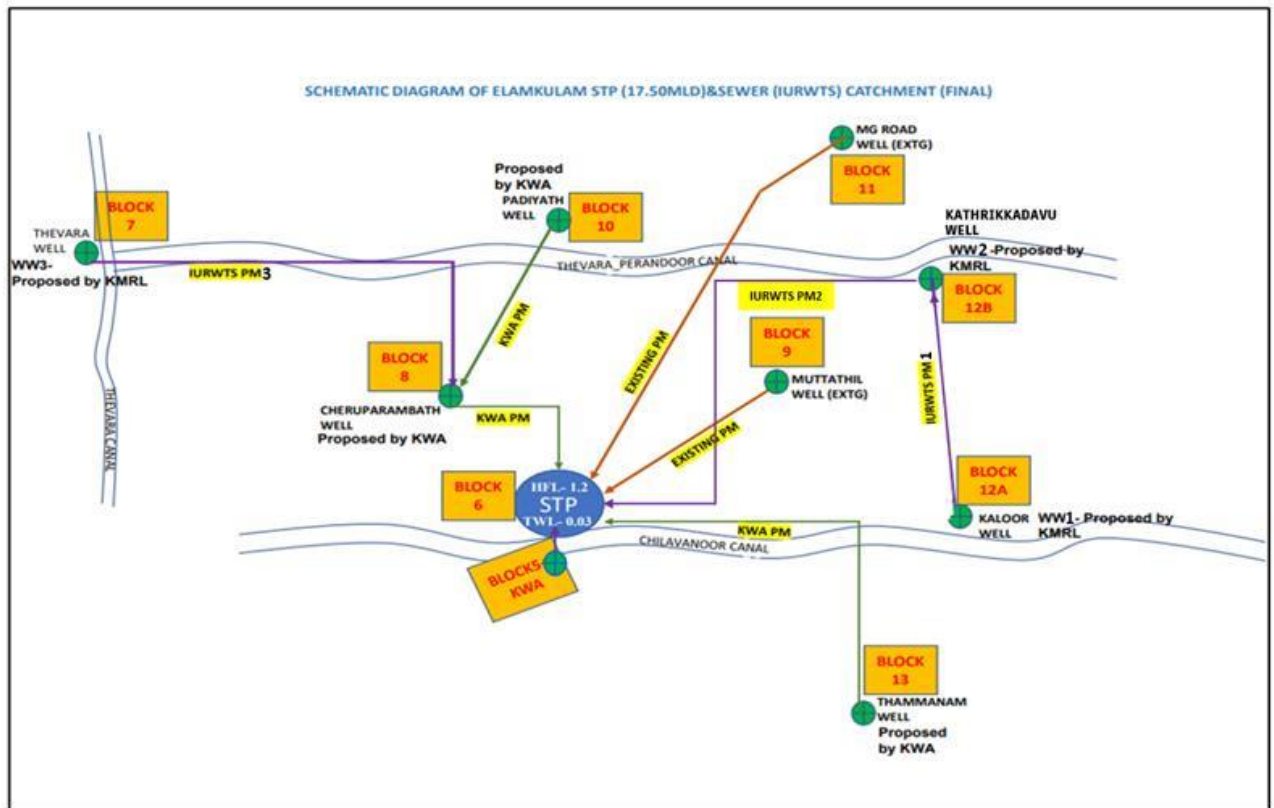


Figure 30: Schematic Diagram

7.3.6.5 Population Projection

The population projection and sewer load calculations were based on Kochi Master Plan of KWA and is attached as **Annexure 1**.

7.4 Design Criteria

The sewage system consists of Sewer network for household connections with suitable pipes, manholes and lifting manholes/lifting stations, pumping stations with wet wells and designed pumps and motors, pumping mains.

For proper design of sewer system, the project area proposed to cover, Population in the area Design period, location of manholes, type of sewer lines, pumping stations if required etc are to be analysed.

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7.4.1 Coverage area

Out of the 6 sewer zones divided for the implementation of IURWTS sewerage system, South catchment areas of Chilavanoor and Thevara-Perandoor Canal is the coverage area for treatment in the newly proposed STP at Elamkulam.

The sewer network caters to parts of 14 Divisions (39,44,45,52,53,55,56,57,60,62,63,64,65,66) of Kochi Corporation. As per 2011 census the population census of Perandoor South catchment and of Chilavanoor South is 67484, and the total projected population is 87326nos. The estimated sewer load for Perandoor canal and Chilavanoor canal is 16.033 MLD. Provision for 14651nos of households is included in the estimate.

Table 27 gives the details of blocks, road networks, manholes, lifting stations and Sewage pumping stations.

Table 27: Abstract of appurtenant structures for sewer network



Description	Blocks	Road network length in km	No of Manhole	No of Lifting stations	No of Pumping stations
Kochi Corporation	10	135.08	5308	7	9 including existing KWA pumping stations)

7.4.2 Estimation of design Sewage Flow

The design flow is based on the design period, population, Floating population, Ground water Infiltration and per capita sewage flow. The flow in sewers varies from hour to hour and also seasonally. But for the purpose of hydraulic design estimated peak flows are adopted. A peak factor of 2.25 is considered as per the norms of CPHEO Manual.

7.4.2.1 Design Period

The design period for this sewer system is taken as 30 years. For pumps and motors, the design period is taken as 15 years for reducing the capital cost. The pumps are designed for intermediate sewage load and ultimate sewer load for a period of 30 years from the implementation year. The sewer load for zone I is calculated for the projected year of 2055.

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7.4.2.2 Population

The population of the catchment area is projected to 2055 based on the census population as per 2011. Floating population is taken as 55% of the projected population for Kochi Corporation. Institutional sewer load is also considered in the design load calculation. In this project population projection and sewer load calculations are based Kochi Master Plan of KWA.

7.4.2.3 Per capita sewage flow

As per the CPHEEO manual, per capita flow /Dry weather flow is taken as 85% of the current water supply of 150 litres per capita per day. 85% of the proportionate quantity of Floating population @ 70 lpcd of 55% of the total Kochi population and non-domestic demand of the Kochi corporation are included in calculating the total sewer load. Ground water Infiltration at the rate of 4500liters/km road length /day is also taken into account for finalising the sewer load.

Total sewer Load for Zone 4 and zone 6 is calculated based on the above flow rate and is estimated as 16.033 MLD for IURWTS project and is designed with a peak factor of 2.25.



7.5 Methodology for design of sewer system for Elamkulam Sewer area

The prospective disposal sites are selected, and their suitability is evaluated with regard to physical practicability for collection of sewage, effects of its disposal on surrounding environment and cost involved.

The new Sewage Treatment Plant (STP) is proposed to construct at Elamkulam nearby Chilavanoor canal. The entire sewer load is to be collected from individual households of the catchment areas and to be conveyed to the STP for treatment.

As per IURWTS Sewerage System concept, the sewer load is collected and conveyed from households by means of tertiary gravity network lines through a trunk main of suitable size based on the availability and technical feasibility, directed to the collection well then to STP or directly STP for treatment. Sewer loads from KWA area joining the IURWTS blocks are considered in designing the sewer network of the individual blocks.

KWA and KMRL are mutually agreed and finalized the well locations and the pumping main alignment routes and was decided that four collection wells at Thevara, Kathrikkadavu, Elamkulam and Kaloore and pumping mains from Thevara to Cheruparambath Well of KWA , Well

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at Kaloor JLN Well to wet well at Kathrikkadavu and from Kathrikkadavu well to 17.5 MLD STP and from Elamkulam well to STP are to be included in DPR of IURWTS and hence this detailed Engineering Report of IURWTS Elamkulam Sewer consists of the design and the estimates for constructing five collection well cum five pumping stations and the five pumping mains(including well at STP).

The sewers slope is maintained in the same direction as the street, existing roads, drains or natural ground surface and are connected to trunk sewers. The individual households will be connected to an interceptor in the individual's plot. The same connected to a manhole which is designed to accommodate 6 household connections and from the manhole connected to sewer network lines and then to a trunk main through which the sewer load is conveying and collected in the Receiving chamber of STP for treatment.

Sewer lines is planned to be laid away from existing water supply and other utility lines as far as possible. Minimum horizontal clearance shall be 3 m and vertical clearance at least 0.5 m. When such situations are unavoidable, sewer is proposed to be encased in concrete or provided with sleeve pipes. Tees, wyes, or chambers will be provided on sewer lines in order to avoid breaking the sewer for future connections.

7.5.1 Layout of System



The first step in the hydraulic design of a sewer network is to prepare a map showing locations of all sewers and measure the contributory area to each point. Profiles along each sewer line are also to be marked. Sewer network design computations are repetitive and hence can be easily done by Tabular form or by using suitable computer software programmes.

The sewer system layout involves the following steps.

- (a) Selection of an outlet or disposal point.
- (b) Prescribing limits to the drainage valley or Zonal Boundaries.
- (c) Location of Trunk and Main Sewers.
- (d) Location of Pumping Stations if found necessary.

A tentative layout is prepared by drawing sewer lines along the streets.

- The direction of flow is shown using arrows which is generally the direction in which ground slopes.




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- In general the sewers will slope in the same direction as the street or ground surface and will be connected by Trunk Sewers.
- The discharge point may be a treatment plant or a pumping station or a water course, a trunk or intercepting sewer.
- The most common location of sanitary sewer is in the centre of the street.
- A single sewer serves both sides of the street with approximately same length for each house connection.
- In very wide streets it may be economical to lay a sewer on each side.
- Manholes are provided at all sewer intersections, changes in horizontal direction, major change in slopes, change in size and at regular intervals
- The vertical layout is dictated by the need to provide minimum cover and the desirability of minimum excavation depending upon the pipe size and expected loads.
- It is design practice to provide a minimum cover of 0.9m at the starting point in the case of sanitary sewer network.
- If the sewer changes direction in a manhole without change of size, a drop of usually 30 mm is provided in the manhole.
- If the sewer changes size, the crown of inlet and outlet sewers are set at same elevation. The vertical drop may be provided when the sewer is intercepted at a higher elevation
- Sewers as a design practice are not located in proximity to water supplies.
- When such situations are unavoidable the sewers should be encased in sleeve pipes or encased in concrete.
- Tees or Wyes should be provided for all house connections both for present and future locations so as to avoid breaking a hole into the side of a sewer.

7.5.2 Profile of Sewer System

- All longitudinal sections are indicated with reference to the same datum line.
- The profile shows ground surface, tentative manhole locations, grade, size and material of pipe, ground, and invert levels etc.
- At each manhole the surface elevation, the elevation of sewer invert entering and leaving the manhole are generally listed.

The Zone 4 and zone 6 including in this report consists of 35 sub catchment areas. Major portion of the zones are densely populated area, and there are 8 pumping station including two existing

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KWA pumping stations. The sewer load is calculated for individual blocks. After preparation of system layout the profile of the sewer system is fixed.

7.5.3 Nomenclature

All the manholes and sewer lines shall be uniquely identified with suitable identification numbers along with flow direction. The trunk sewer should be selected first, and drawn and other sewers should be considered as branches. The trunk sewer should be the one with the largest diameter that would extend farthest from the outfall works. Whenever two sewers meet at a point, the main sewer is the larger of the incoming sewers. Once the rough sections have been prepared, the designer should review the work for improving the spacing of manholes, the sizes, and gradients of the sewers and so forth, economising on materials and excavation to the extent possible. At the same time, the designer must ensure that the sewer will serve all users and that they can be actually laid according to the alignments shown in the drawing and have sufficient gradients.

The sewers should be shown as thick lines and the manholes as small circles in the plan. In the section, the sewer may be indicated by a line or two lines depending upon the diameters and scales adopted. Grade, size and material of pipe, ground and invert levels and extent of concrete protection should be indicated.



In this project, for identity, each manhole in the main trunk and main branches is serially numbered prefixed with road name. Small lanes as branches to the main sewers are named as subbranches of main sewer. If the manhole along a main road of AKG Road id AKGRDM1, then the branch sewer manholes will be AKGM1.1, AKGM1.2, AKGM1.3 etc.

7.5.4 Design of the network

After finalizing the boundaries for each blocks, the load from KWA if any ,to these blocks are collected and added as point loads in the respective manholes es of the blocks and included in the design.

7.5.4.1 Shape of the Sewer lines

Circular sewer sections are ideal from load bearing point of view as the hydraulic properties are better for varying flows.

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7.5.4.2 Size of the Sewer lines

Minimum diameter for public sewer shall not be less than 150 mm (internal) except for sharply falling gradients. The minimum diameter in public roads shall be 150 mm and that for house sewer connections to public sewers shall be 100 mm. However, depending on growth potential in certain areas even 150 mm diameter can also be considered. However, in towns having present / base year population of less than 1 lakh, the minimum diameter of 150 mm shall be adopted.

For this project area, minimum size of sewer line is fixed as 200mm diameter in discussion with M/S.CUBE-IIT and KWA.




7.5.4.3 Carrying capacity of sewer lines

All sewers will be designed to flow up to a maximum depth of 0.80 times (i.e., 80 %) the internal diameter of sewer at ultimate peak flow (As per the CPHEEO Sewerage Manual) in order to ensure proper ventilation in sewers. However, such provision will be simultaneously checked for self-cleansing velocity in present peak flow condition.

7.5.4.4 Velocity of Sewer

It is required to maintain minimum velocity through the sewer to ensure that suspended solids do not deposit and cause choking. Hence, it is mandatory to maintain “self-cleansing velocity” in sewer lines. As per Govt. of India stipulations: The minimum self-cleansing velocity required is 0.6 m/sec at present peak flow to prevent 0.09 mm sand particles of sp. gr. 2.65 from settling. The maximum scouring velocity is limited to less than 3.0 m/sec to safeguard the sewer against abrasion and erosion by sand and other gritty material and also against possible sulphide corrosion (as a result of release of hydrogen sulphide gas due to turbulence).

At certain stretches, viz. the tail ends of laterals, branches and even on the main sewer, minimum velocity for design flow is likely to be less than minimum self-cleansing velocity. At certain stretches, where velocity corresponding to peak flow condition is high, manholes and sewers will be flushed out during peak flow in removing silt, which got deposited during minimum flow period, especially during night hours. Adopting lower values of velocities through lesser gradients will help in avoiding deep excavations for sewer laying. In developing a particular sewer collection network, this point shall be given due consideration prior to design of sewers.

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As per the directions from the vetting agency, M/s. CUBE-IIT the minimum velocity at the initial stretches have been taken as 0.3 m/sec . The necessary flushing units of suitable capacity are also proposed , for the area.

Recommendation from M/s. CUBE-IIT for Velocity criteria



- Optimization of sewer network based on the design interventions made by M/S.CUBE-IIT with reducing the minimum velocity criteria to 0.3 m/s as against 0.6 m/s in light of the guidelines in Chapter 3, Sec:3.29 of CPHEEO Manual under Flushing Manholes will help to evolve pragmatic strategy:
- Where it is not possible to obtain self-cleansing velocities due to flatness of the gradient especially at the top ends of branch sewers, which receive very little flow, it is essential that some form of flushing device be incorporated in the system
- A more practical and relatively safer method is to deploy the modern jet rodding machines at head manholes and use the treated sewage from the STP, but then, the cost of the machine is involved.

7.5.4.5 Sewer transition

Sewer transition is defined as an event or point at which there is change in diameter of sewer or its alignment, junction of two or more sewer lines, etc. These changes can occur singly or as a combination of two or more factors. The preparation of hydraulic design of sewers has to take into account the changes in hydraulic profile of sewers due to such transitions. Usually, the diameter of the sewer increases progressively. For design purposes, it is assumed that energy losses and changes in depth, velocity and invert elevation occur at the centre of transition and afterwards these changes are distributed throughout the length of transition. Minimum slope of sanitary sewers is given in **Table 28**.

Table 28: Minimum slopes of sanitary sewers

Sewer Size (mm)	Minimum Slope		Sewer Size (mm)	Minimum Slope	
	As percent	As 1 in		As percent	As 1 in
150	0.60	170	375	0.15	670
200	0.40	250	450	0.12	830
250	0.28	360	≥ 525	0.10	1000
300	0.22	450			

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Manholes shall be located at all such transitions and a drop shall be provided where the sewer is intercepted at a higher elevation (if vertical drop in elevations is more than 60 cm). If the vertical drop in elevations is less than 60 cm, it can be avoided by adjusting the slope in the channel and in the manhole connecting the two inverts. Transition from larger to smaller diameters shall not be made.

The crowns of sewers are always kept continuous. In no case, the hydraulic flow line in the large sewers shall be higher than the incoming one. To avoid backing up, the crown of the outgoing sewer shall not be higher than the crown of incoming sewer.

A junction occurs where one or more branch sewers enter a main sewer. Well-rounded junctions are required to prevent deposition. Vertical pipe drops are used frequently at junctions for which main sewer lines well below the branch sewers. These pipe drops are designed with an entrance angle of 30 degrees with the main sewer.

An inverted siphon can be provided to carry the sewer under the obstruction and regain as much elevation as possible after the obstruction is passed. They shall be resorted to only where other means of passing the obstruction are not feasible as they require considerable attention in maintenance.

7.5.4.6 Hydraulic Design Formula

Manning's formula is used for designing slopes and diameter of the sewer line to carry the design flow at stated velocity.

7.5.4.7 Manning's Formulae

The flow in the sewer lines is calculated using Manning's formula.

$$V = [(1/n)] \times [R^{2/3} S^{1/2}]$$

For Circular Conduits,

$$V = (1/n) (3.968 \times 10^{-3}) D^{2/3} S^{1/2}$$

and

$$Q = (1/n)(3.118 \times 10^{-6}) D^{2.67} S^{1/2}$$

Where,

Q- Discharge in l/s



S= Slope of hydraulic gradient

D- internal diameter of pipe in mm

R- Hydraulic radius in m

V- Velocity in m/s

n- Manning's coefficient of roughness

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(The value of Manning's co-efficient ('n' value) for uPVC / HDPE pipe is 0.011, for DI pipe (cement mortar lined) is 0.011, for RCC pipe is 0.011 (for rubber gasket jointed pipes) and for stoneware pipe is 0.012.)

7.5.4.8 Design Depth of Flow

The sewers shall not run full as otherwise the pressure will rise above or fall below the atmospheric pressure and condition of open channel flow will cease to exist. Moreover, from consideration of ventilation, sewers should not be designed to run full. In case of circular sewers, the Manning's formula reveals that,

- The velocity at 0.8 depth of flow is 1.14 times the velocity at full depth of flow.
- The discharge at 0.8 depth of flow is 0.98 times the discharge at full depth of flow.

Accordingly, the maximum depth of flow in design shall be limited to 0.8 of the diameter at ultimate peak flow.

For hydraulic design of the network, in order to facilitate the calculations easily, the hydraulic properties at various depths of flow are compiled and is added below **Table 29**. (Ref Table 3.12 of CPHEEO manual Chapter 3).

Table 29: Hydraulic properties of circular sections for Manning's formula

Qa/Qf	d/D	Va/Vf
0.0000	0.0700	0.3000
0.0100	0.0700	0.3000
0.0200	0.1000	0.4000
0.0300	0.1300	0.4600
0.0400	0.1500	0.5100
0.0500	0.1600	0.5300
0.0600	0.1700	0.5500
0.0700	0.1900	0.5900
0.0800	0.2000	0.6100
0.0900	0.2100	0.6300
0.1000	0.2200	0.6500
0.1100	0.2300	0.6700
0.1200	0.2400	0.6900
0.1300	0.2500	0.7000
0.1400	0.2600	0.7100
0.1500	0.2700	0.7300
0.1600	0.2800	0.7400
0.1700	0.2900	0.7500
0.1800	0.3000	0.7600

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Qa/Qf	d/D	Va/Vf
0.1900	0.3000	0.7700
0.2000	0.3100	0.7800
0.2100	0.3200	0.7900
0.2200	0.3300	0.8000
0.2300	0.3300	0.8100
0.2400	0.3400	0.8300
0.2500	0.3500	0.8400
0.2600	0.3500	0.8400
0.2700	0.3600	0.8500
0.2800	0.3700	0.8600
0.2900	0.3800	0.8700
0.3000	0.3800	0.8800
0.3100	0.3900	0.8800
0.3200	0.4000	0.8900
0.3300	0.4000	0.9000
0.3400	0.4100	0.9100
0.3500	0.4100	0.9200
0.3600	0.4200	0.9200
0.3700	0.4300	0.9300
0.3800	0.4300	0.9300
0.3900	0.4400	0.9400
0.4000	0.4400	0.9400
0.4100	0.4500	0.9500
0.4200	0.4500	0.9600
0.4300	0.4600	0.9700
0.4400	0.4700	0.9800
0.4500	0.4700	0.9800
0.4600	0.4800	0.9800
0.4700	0.4800	0.9900
0.4800	0.4900	0.9900
0.4900	0.4900	0.9900
0.5000	0.5000	1.0000
0.5100	0.5100	1.0100
0.5200	0.5200	1.0100
0.5300	0.5200	1.0200
0.5400	0.5300	1.0200
0.5500	0.5300	1.0200
0.5600	0.5400	1.0300
0.5700	0.5400	1.0300
0.5800	0.5500	1.0300
0.5900	0.5600	1.0400
0.6000	0.5600	1.0400
0.6100	0.5700	1.0500
0.6200	0.5700	1.0500

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Qa/Qf	d/D	Va/Vf
0.6300	0.5800	1.0500
0.6400	0.5900	1.0600
0.6500	0.5900	1.0600
0.6600	0.6000	1.0700
0.6700	0.6000	1.0700
0.6800	0.6100	1.0700
0.6900	0.6100	1.0800
0.7000	0.6200	1.0800
0.7100	0.6300	1.0800
0.7200	0.6300	1.0900
0.7300	0.6400	1.0900
0.7400	0.6400	1.0900
0.7500	0.6500	1.1000
0.7600	0.6500	1.1000
0.7700	0.6600	1.1000
0.7800	0.6700	1.1000
0.7900	0.6700	1.1000
0.8000	0.6800	1.1100
0.8100	0.6800	1.1100
0.8200	0.6900	1.1100
0.8300	0.7000	1.1200
0.8400	0.7000	1.1200
0.8500	0.7100	1.1200
0.8600	0.7200	1.1200
0.8700	0.7200	1.1200
0.8800	0.7300	1.1300
0.8900	0.7400	1.1300
0.9000	0.7400	1.1300
0.9100	0.7500	1.1300
0.9200	0.7600	1.1400
0.9300	0.7700	1.1400
0.9400	0.7700	1.1400
0.9500	0.7800	1.1400
0.9600	0.7900	1.1400
0.9700	0.8000	1.1400
0.9800	0.8000	1.1400
0.9900	0.8100	1.1400
1.0000	0.8200	1.1400

7.5.4.9 Manholes

Sewer transitions occur wherever conduits of different characteristics are connected. The difference may be in flow, size, grade and alignment, material of conduit, with a combination of

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one or all characteristics. Manholes have been located at all such transitions with CI/PVC footrest for access. As per CPHEEO Manual

The diameters of circular manholes for stated depths of sewers are in **Table 30**.

Table 30: Diameters of circular manholes for stated depths of sewers

No.	Range of Depths, m	Internal Diameter
1.	Above 0.90 m and up to 1.65 m	0.9 m
2.	Above 1.65 m and up to 2.30 m, 1200 mm	1.2 m
3.	Above 2.30 m and up to 9.0 m	1.5 m
4.	Above 9.0 m and up to 14.0 m	1.8 m

Ref CPHEEO Manual 1990




The size of the access cover should be of 560 mm clear opening. Since the manholes are to be located on roads with trucks plying on them, steel fibre reinforced concrete covers (SFRC) of heavy-duty HD-35 designation and conforming to IS: 12592 have been proposed.

For straight sections, the interval at manholes on sewers, which are to be cleaned manually and cannot be entered for cleaning or inspection, the maximum distance between manholes should be kept at 30m. However, for economical consideration a manhole spacing of 50 m C/C shall be provided for all trunk sewers having diameter more than 600 mm.

For this project 1.2 m diameter circular manholes up to a depth of 2.5m depth of cutting and 1.5m diameter circular manholes for depth of cutting up to 4.5m depth of cutting are included for designing. For restricting the depth of cutting lift manholes are provided with automated functioning.

7.5.4.10 Lift Stations/Lift Manholes

There are cases where high water table conditions or rocky strata pose considerable difficulties in the design and provision of conventional gravity sewerage system in that excavations amidst sub soil water or rocky terrain is not only difficult but also is frowned upon by the public when the works drag on and on in the middle of the road. Such situations can be easily got over by restricting the depth of sewers to a practicable limit and diverting the flow into a pavement submersible pump station with a lockable control panel there itself. In such situations, it is advantageous to opt for intermediate lift stations, which are like “on line”. In general, these are

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submersible pump stations, which are interposed in the gravity sewer network. The procedure is to sink a wet-well on the road shoulder or an acquired plot beyond the shoulder and divert the incoming deeper sewer to it and the submersible pump set therein will lift the sewage and discharge it to the next on line shallow sewer.

As the sewer progresses, any number of such lifts can be inserted based on the location as given in **Figure 31**. This is similar to the pillar boxes of the electricity board and the delivery main can lift the flow to the downstream manhole at the conventional 0.9 m depth to invert. With the availability of quite a few manufacturers of sewage-submersible pump sets in the country it should be possible to implement this instead of struggling with deep sewers in such areas for years together and more importantly compounding the problems of O&M and the repairs at these depths perpetually. These submersible pump stations can be operated by mercury float switches and powered by dedicated feeder lines from the local electrical authority similar to the lines given to the hospitals, etc. These pump sets can also be connected to solar panels. The pump pit can be covered with pedestrian grade walkway slabs, which are of RCC and with adequate lifting arrangements to permit the lowering and lifting the submersible pump sets.

These shall be connected to dedicated electricity feeders as installation and O&M of standby diesel pump sets etc., are not feasible in such locations.

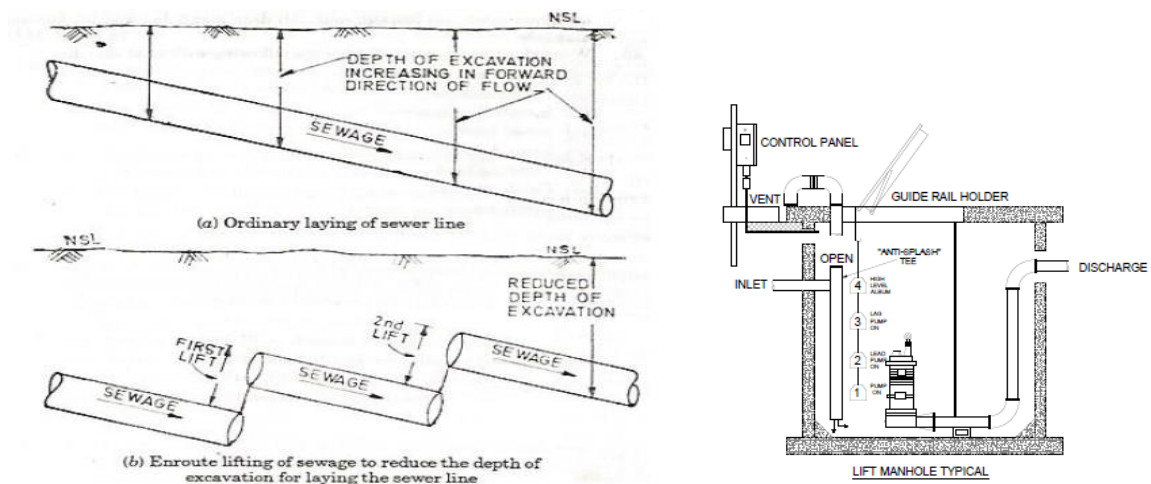


Figure 31: Enroute lifting of sewerage line and a typical lift manhole

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In this IURWTS Project the high-water table and the topography of the catchment area of the canals, the depth of cutting shall be limited to 4.5m and hence the lifting stations are proposed to lift the sewage at certain intervals.

7.5.5 Pumping Stations and Pumping Mains



These are designed and constructed in the same way as any other water pumping mains. The exception being that the design practice of economical size of pumping mains in conjunction with the electrical energy of the pump sets as used in water pumping mains is not applicable in sewage pumping mains. This is due to varying rates of discharge through the 24 hours like low, average and peak flows through the same main at various parts of the day and night. The Hazen Williams formula is used for design of pumping mains.

Pumping mains designed for velocities between 0.6 to 2.4 m/s are normally based on the most economical pipe diameters and typical available heads. For shorter pumping mains of less than 600 m and low lift requirements of less than 10 m, the recommended design force main velocity range is 1.8 to 2.7 m/s. This higher design velocity allows the use of smaller pipe, reducing construction costs. Higher velocity also increases pipeline friction loss resulting in increased energy costs.

The maximum velocity at peak conditions is recommended not to exceed 3 m/s. In the case of water pumping mains, economical size of pumping mains is calculated by trying out various sizes and finding out the net present value of the capital costs of pipeline and pumping machinery and capitalized electrical energy costs. In the case of sewage, this is not possible because of the complexity of varying pumping rates during lean flow, average flow and peak flows resulting in near impossibility of doing the economical size calculations.

Hence, the rule of thumb is recommended whereby the maximum velocity in peak flow does not exceed 2.7 m/s and the minimum velocity at low flows is not less than 1 m/s.

There are 9 number of pumping stations proposed for the collection and conveyance of sewer load generated in IURWTS area as well as KWA area of Elamkulam sewer zone. Out of the nine pumping stations, two stations are the existing ones owned by KWA which are underutilization at present. There are 7 pumping mains for conveying the sewer load collected in the wells at the above-mentioned pumping stations.

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Details of distribution of KWA and KMRL sewer area to individual pumping stations is described in Section 7.4.1 and the schematic diagram for the same is as shown in **Figure 30**.

Based on the topography and location of collection wells and location STPs, the sewer area of KWA and KMRL jointly analysed and split up into various blocks. IURWTS area is thus consists of 9 blocks , conveying sewer load by Trunk mains/ Pumping mains from Well to well and from well to Pumping stations.

The pumping stations which are pumping to the other wells other than directly to Raw sewage sump of STP shall include minimum components such as coarse and screen, wet well, pumping platform, motor, panel board and sufficient ventilation.

Ductile Iron pipe of 400mm diameter Class K9 is proposed as IURWTS pumping mains. HDPE pipe of equivalent diameter with high strength is not available for sewerage pumping mains. The pumping mains are checked for water hammer also.

Collection wells cum pumping stations were designed for sewer load of 3.07 at Kathrikkadavu, 6.08MLD at Kaloore Well, 4.80MLD at Thevara and 6.49MLD at Elamkulam. Pumping mains (PM1) of 300mm diameter DI K9 pipe for Kathrikkadavu to Kaloore well, 350mm diameter DI K9 Pipe(PM2) from Kaloore well to STP , 350mm diameter DI K9 (PM3) from Thevara well to Cheruparambathu well and 350mm diameter DI K9 pipe (PM4) from Elamkulam to STP are also designed and estimate for the well cum pumping station and pumping mains are included in the project Cost of this DPR for Elamkulam Sewer zone.

7.5.6 Typical hydraulic Design of the sewer network



The next step is the design of the network and is the most important component of the sewer system. Computer aided design using excel software is being done for the design of Zone I sewer area. Block wise covered area and the Projected population for individual blocks for the design period are calculated and tabulated in **Table 26**. The design sheets (excel) is attached as **Annexure 6**.

Computer Aided Design using Excel software (CPHEEO Manual)

The design consists of the following steps.

Step 1 Input data for computation of sewage Flow

Data 1- The projected population of the block for the year 2055

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Data 2 – Floating Population – proportionate number of 55% of the projected population

Data 3 – Ground Water Infiltration – 4500 litres/Ha/day

The input data for individual blocks is prepared. As per the input data design calculations is as follows.

Input data for Block 10 : From the layout and profile of the block under designing, the total sewer length proposed for conveying sewer load in tertiary as well as secondary sewers is to be entered, Sewer generation, Groundwater Infiltration, Unauthorised storm water drain connection per meter length is calculated by Excel programmed sheet.




Design Calculations for Elamkulam STP catchment

Total Population as per 2055 (Ultimate)	1418	Persons
Total Pipe Length	2650	m
Sewage Generation/m length	0.098	cum/day

Then the sewer lines From Manhole ID to Manhole ID, sewer length, Existing GL of From and To Manholes are entered in the already programmed Excel sheet. In addition, Peak factor, the Manning's constant, Manhole drop and proposed slope for attaining gravity flow with self-cleaning velocity are also to be entered. This excels sheet automatically calculates the sewage flow, size of the pipe required. Type of the Manhole such as start, junction, continuous are also defined in this programme so that cumulative flow(q_1) for each manhole appears in the respective cells.

As per CPHEEO Norms minimum size of the pipe shall be 200mm . Design also fix the material of the sewer line. Here, DWC/uPVC pipe for size up to 300mm ID and HDPE pipe for more than 200mm ID is proposed. Clear cover of the pipe from the ground level is assigned as 0.90m. Slope for the minimum size of 200mm ID and DWC material maximum discharge (Q) is calculated using Manning's Formulae.

For the ratio q_1/Q , using table for Hydraulic properties of Manning's formula, Velocity ratio Vactual (v_a) / v maximum (v_f) and Depth ratio (depth to diameter) d/D is determined. From these two values, d/D can be checked whether <0.80 and actual velocity for the entered slope, size and load of the sewer line is a minimum of 0.6m/Sec.

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By knowing the slope and length of the sewer between two manholes, the fall will be getting. Invert levels of Start Manhole and End Manhole are then calculated, which gives the depth of cutting for each pipe length. The depth of cutting for the area is restricted to 4.5m due to the topography of the site the depth of cutting goes up to 8m. Hence Lifting stations are proposed at manholes where the depth of cutting exceeds 4.5m. Minimum depth of cutting is 1.10m.

The design process is repeated for each stretch until minimum self-cleaning velocity with minimum dia. of pipe in conjunction with minimum slope or within the range in CPHEEO manual and the depth of cutting is achieved.

Fixing pipe size and material



As per the recommendations from M/S.CUBE-IIT and in discussion with KWA the design incorporates with following criteria for fixing pipe size and material.

- Minimum size of pipes for Gravity sewers in Kochi Corporation / potential areas prone to higher population growth) shall be upgraded to 200 mm
- DWC pipes for gravity sewer lines up to 300mm diameter and HDPE pipes for gravity sewer above 300 mm diameter
- For pumping mains KWA recommends HDPE / DI pipes of designed size and class

By designing each block network, the end sewer line is directed to the receiving chamber or to collection well from which is pumping to collection chamber of STP.

7.5.7 Estimates

The estimate for the entire blocks is prepared on PRICE using DSR 2018. The estimate includes dismantling Bitumen/CC/Paved roads and restoration of the dismantled roads after execution, laying of sewer lines, Manholes, Lifting manholes and household connections. The total estimate cost is **INR 265.84 Crores**. The estimate details are given is annexed as **Annexure 5**.

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7.6 Conclusion

Design Parameters for Proposed Sewer line works

Description	Design Parameters
Design period	30 Years as per CPHEEO Manual
Sewage Contribution	85 % water supply including Kitchen waste 150 LPCD
Population Forecast	Based on 2011 population census data projected to year 2055 -87326
Ground Water Infiltration	a minimum infiltration flow i.e. 10% of flow has been considered in the design 4500litres per km sewer length
Hydraulic Formula	Manning's formula has been adopted in design. It is suggested by Manual & is best for gravity flow in channels/pipes
Peak Factor	PF as per manual is followed.
Depth of Flow in pipes	Not exceeding 0.7 full at ultimate peak flow
Self-Cleaning Velocity	Not less than 0.3 m/sec for peak flow but in initial stretches the minimum velocity cannot be achieved in design. Therefore, flushing system as CPHEEO Manual has been proposed in initial reaches, where velocity is less than desired.
Maximum Scouring Velocity	Restricted to 3 m/sec
House Sewer Connection	Provision of house connection for collection of wastewaters has been proposed from property line to manhole by uPVC/ HDPE/ DWC pipe.
Design calculation	On Excel computer sheet as per CPHEEO manual procedure, and validation by SEWER CAD for selected pockets
Selection of Sewer Slopes	Guideline of CPHEEO Manuals, has been followed
Manholes	The provisions of manholes have been proposed as per guidelines given in CPHEEO Manual
Drop Arrangement	Drop arrangement is proposed where the laterals join the manholes of main sewer and difference between invert levels of incoming and outgoing pipe is greater than 600 mm.
Manholes Construction	RCC Manholes included in the estimate. If required Precast concrete manholes with a combination of Brick masonry cm (1:4) and plastered from both sides in 1:3 CM for greater heights can be adopted . PE manholes can also be proposed for waterlogged areas.

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Description	Design Parameters
Lift Manhole	Considering the topography and the water table conditions, the depth of cutting has been limited to 4.5m for Kochi city All the lift stations for each block will be regulated by the respective receiving pumping stations by providing dedicated electrical feeder line. Automation and integration with STP is also proposed
Covers and Frames	The covers for circular manholes shall be with clear opening not less than 600mm. The manhole covers of SFRC are suitable to withstand heavy traffic loads as per IS standard.
Pumping Stations and Pumping Mains	Four pumping mains of 350mm and 300 mm Ductile Iron CI K9 pipes, are proposed under this project. Five well cum pumping stations (including STP) are proposed
Selection of Minimum Pipe Size	Sizes of the pipe are between 200mm (OD) to 630mm (OD). Looking to the smaller size where in-lining is difficult and also corrosive nature of sewage the material of pipelines has been adopted DWC/HDPE class pipe and minimum pipe size considered is 200mm dia.
Pipe Material	DWC/HDPE/uPVC SN-8 class pipes for sewer lines is proposed. From 160mm, 200mm, 250mm, 350mm & 400mm,450mm,500mm,560mm size, DWC/HDPE pipe has been proposed. For pipes 300mm, 350mm & above 450 mm dia. of sewer line has been proposed with HDPE PE-100 PN-8 class pipes.
Structural Design of Sewers	The structural design of sewers will be done in accordance with the guideline provided in the manual of sewerage and sewage treatment and in accordance with IS Code 4127- 1967, 783-1959. The load over pipe will be calculated of refilling material both under trench and culvert condition. If the load calculated by use of trench formula is more than the load calculated by the culvert formula, the latter will be taken as the load on the pipe in trench due to filling material. Load imposed where necessary, on the pipe due to surface load has been considered, depending upon the class of wheel load. Care will be taken to see that the field loads on the pipe leave a factor of safety of 1.5 over its corresponding supporting strength. If the worst combination of a field loading on the pipe is achieved,

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Description	Design Parameters
	then it is assumed that the supporting strength of the pipe shall leave a factor of safety of 1.5. DWC/HDPE/uPVC will be selected as suggested in the above criteria
Construction of sewer	Construction of sewer is proposed as per Manual.
Geology of the project area	The average water table is between Kochi Corporation : 1.2m - 1.5m bgl
Maintenance of sewer network	The sewer network proposed to be laid shall be maintained by the contractor for 10 years including 2-year defect liability period.
Schedule of Rates	KIIFB PWD PRICE 2018 with cost index
EIRR/FIRR for the whole IURWTS project	26.41 / 5.24



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8. Environmental Impact Assessment for Sewerage System

8.1 Introduction

In Kochi city and the surrounding areas, wastewater disposal into the drains and canals is the main environmental issue that has created unsanitary conditions, odour, mosquito problems within the city, and affecting the health of the inhabitants. This is due to lack of appropriate O&M by the authorities to clean the onsite sanitation facilities resulting in overflow of the septic tanks. The 4.45MLD Sewage Treatment Plant at Elamkulam owned by KWA (commissioned 65 years back) is running at an efficiency of less than 3.5MLD. Another STP under AMRUT scheme of Govt. of India is in the implementation stage which is conceived for covering the same area as that of the existing old STP at Elamkulam.

The Environmental Impact Assessment (EIA) Study undertaken by the General consultant (GC)(Antea Nederland), was to examine the environmental issues that will be encountered during the construction and operation phase of the project activities and their likely impact. Further, to reduce the potentially significant adverse impacts to acceptable levels, feasible and cost-effective measures are brought out in Environment Management Action Plan prepared GC for the IURWTS project. To bring the same into actions, the mitigation measures proposed will be incorporated into the contract conditions of the bid documents. This will help the contractors to take cognizance and implement them during construction and operation phase in accordance with statutory requirement of funding agency, (Kerala Infrastructure Investment Fund Board (KIIFB)). The study conducted also in lines with the KIIFB guidelines adhering to the of environmental and social considerations of the project. The main objectives of this study are as follows.

- To assess the existing status of air (including climate), noise, water and land environment, natural resources, quarries, natural (biological/ecological) environment, aquatic animals in project influenced areas and, socio-economic components of the environment including parameters of human interest sat the project site.
- To identify potential significant impacts on the above environmental components due to proposed project activities, including impacts due to discharge of effluent from the sewage treatment plant.
- To predict significant qualitative and quantitative impacts on the major

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environmental components

- To prepare an environmental impact statement based on identification, prediction, and evaluation of impacts.
- To prepare an Environmental Management Action Plan (EMAP) outlining preventive and control strategies for minimizing adverse impacts due to proposed activities.
- To formulate environmental quality monitoring program to be pursued by GC as per requirement of KMRL/KIIFB.



The selected sites for the STPs are such that there are no thick vegetations and aged trees. Certain bushes are seen spread in the site. Coconut trees and palm trees found in some areas. It has been ensured that the effluent disposal into the adjacent water bodies adhering to the regulatory standards will not pose any problem to the nearby locality. It is also envisaged to undertake landscaping and planting trees inside the STP site so as to provide a natural green belt and to act as a buffer zone. There are no mangroves in the proposed location and there are no drinking water resources in the vicinity of any of the STP sites.

8.2 Scope of EIA

Preparation of environmental impact assessment report incorporating baseline data along with an environmental impact statement based on field studies, identification, prediction and evaluation of impacts of the proposed activities related implementation of sewerage scheme under to IURWTS Project. Preparation of an Environment Action Plan (EMP) outlining preventive and control strategies for minimizing adverse impacts due to proposed activities along with their cost and time schedule for implementation. Incorporations of Environmental considerations into the project planning and design have been taken as an integral part of project preparation. Public hearing also forms part of this project to understand the opinion and apprehension of the public for the activities undertaken as part of the IURWTS project.

8.3 Environmental Impact Assessment and Environmental Management Plans

The EIA preparation led to identification of potential environmental impacts and their feasible remedial measures (including avoidance, mitigation, and enhancements), which have been included as environmental management plan.

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This report of EIA studies is as per the requirements of Environmental Impact Assessment Notification of Ministry of Environment and Forests (MoEF&CC) under the Environment Protection Act, 1986 and Guidelines issued by KIIIFB.

8.4 Brief description of Project size, the Process and Location



IURWTS project proposes four sewage treatment Plants at locations Vennala, Muttar, Perandoor and Elamkulam for treatment of the sewage generated in the catchment areas of project canals. The STP at Elamkulam is an upgradation scheme of the existing STP. The other three STP locations are at the tail ends of the canals and not in populated areas. The locations are such that it is away from the urban fabric and there are no residential buildings in a radial distance of 50m from the STP site. Cent percent sewer network connectivity is proposed, and the sewage load will be collected from the households will be conveyed by gravity through the tertiary networks. Where subdrains are available in the catchment secondary lines will collect the load from the tertiary network at various locations along the subdrain. Further the sewage load will be conveyed by gravity to the primary network running parallel to the main canals. Pressurized flow will convey the sewage load in the primary line to the sewage treatment plant.

The SBR wastewater treatment technology is proposed considering the improved regulatory requirements achieved by the process. This STP will consist of a Collection well, Screen chamber, Grit chamber, Aerator, Centrifuge, Chlorinating chamber, and Pump houses. The wastewater flows initially by force and then by gravitationally which treated by the action of aerobic bacteria with specific maintenance and electric power use. Activated Sludge process with SBR technology provides secondary level treatment to wastewater. It significantly reduces the BOD, nitrogen, phosphorous, toxic substances, and other pollutants found in the wastewater.

The treated wastewater from the aeration tank will be disinfected using chlorine gas before its disposal for use of watering plants for maintaining the green belt of STP. The level of treatment will comply with the standards of the Central Public health and Environmental Engineering Organization (CPHEEO), MoEF&CC and the World Health Organisation (WHO) regulatory standards. This makes it safe for irrigation, or discharge in the water bodies..

8.4.1 Importance of Sewer network & STP to the Local community

Wastewater disposal is the pressing environmental issue for the inhabitants of Kochi city as well as adjoining municipal areas forming part of IURWTS catchment. Currently households discharge

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their wastewater in septic tanks, which often overflow especially during the monsoon months due to lack of timely cleaning and maintenance and create unhealthy conditions in the IURWTS project area. It has already created nuisance and social problems among the inhabitants. Clean environment will improve the health standards of the local people, and with the implementation of cent percent sewer network and STPs in IURWTS catchment which help to have an environmentally sound solution to their wastewater disposal problem. This will help to eliminate the spread of diseases, prevent risks of contamination of their surface and groundwater resources and contribute to the preservation of the quality of environment, The corporation council has given a no objection clearance for implementation of the project and the residents of the project area have welcomed the project proposal for cent percent sewer network coverage to the households of IURWTS catchment.

8.4.2 Environmental concerns of the Project



The Sewer network and STP of IURWTS project aims at environmentally safe disposal of its wastewater, for upgrading the sanitary and health standards of the inhabitants.

The Long-term concerns include:

- Prevent the spread of diseases, including the limitation of the mosquito population,
- Prevent the prevalence of conditions offensive to sight and smell.
- Control the contamination of water sources.
- Prevent and control soil and groundwater pollution.

The specific concerns of the project are to:

- Establish cent percent household connectivity through sewer networks and STPs suitable for the catchment as a whole, which will adopt advanced technology, be cost effective, and requires the minimum maintenance.
- Manage the pathogenic risk inherent in wastewater to meet the effluent discharge standards set by the CPHEEO, Ministry of Urban, Government of India and World Health Organization.
- Manage the safe disposal of sludge.

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8.4.3 Description of the Surrounding Environment of the Project

IURWTS project has four STPs for treating the sewage generated in the catchment areas of the canals proposed for rejuvenation. The canals under project scope are Edappally Canal, Chilavanoor Canal, Thevara Perandoor Canal, Thevara Canal and Market Canal. Though the canals flow amidst the heartland of Kochi city, the STP locations are selected at tail ends of the canals since the sewer lines are proposed along the sides of canal banks.



There are no notable industrial activities in the project area. Farming activities near the site are absent. There is no fruit farms located near the site. Households of the project area get their fresh water from KWA's piped supply, and its treatment plant is located 25km away and its source 'Periyar River' is passing 25km away from the city. The climate of the project area is humid and is influenced by the South-West and North east monsoon for nearly 6 months (June-Nov) of the year. The prevailing wind direction in the area is from West to East. The average annual decadal rainfall in the area recorded as 2800mm. The project area, including the proposed sites, has a less biodiversity, coconut trees, mango trees, jackfruit trees, plantain trees and small house gardens including vegetable gardens are seen in the project area. No notable animals and birds are seen living in the area.

8.4.4 Subjects caused under Environmental Impact Study

By way of undertaking the STP and sewer networks in the IURWTS catchment it is expected that there will not be any permanent negative or adverse environmental or social impacts. The temporary impacts expected on water quality, air quality (impact on health), traffic blockages and safety hazards for pedestrians, possible damage to private property, possible interruption in commercial activity and accidental breakage of other public infrastructure such as water pipes etc.

Major constructions activities concerned with EIA include

- Earth work and laying Sewer lines.
- Construction of manholes
- Route of Sewer primary mains (Gravity)
- Route of Sewage Pumping Mains
- Construction of Sewage Treatment Plant
- Construction of materials including the filter materials.

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- Wastewater and Sludge disposal
- Chemicals used for Tertiary treatment.
- Sheltering of construction workers.

The Water and Air (prevention and Control of Pollution) Acts: The Water (Prevention and Control of Pollution) Act, 1974 resulted in the establishment of the Central and State level Pollution Control Boards (CPCB and SPCB) whose responsibilities include managing water quality and effluent standards, as well as monitoring water quality, prosecuting offenders and issuing licenses for construction and operation of certain facilities similarly. The Air (Prevention and Control of Pollution) Act, 1981, empowers the SPCBs to enforce air quality standards set by the CPCB. With limited possibility, the provisions of the Hazardous Wastes (Management and Handling) Rules, 1989 and the chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 would also apply during the construction and the operation periods. The applicability of Acts and Rules to the JNNURM Sewerage Scheme to Kochi has been considered.

8.5 Odour Control Measures

The general objectives of the Odour Control Plan for sewer network and STP is,

- Provide an overview of odor issues associated with the wastewater collection system.
- Document and evaluate the current odor control program in vogue.
- Document the effort to characterize odors and identify their causes within the collection system.
- Provide control measures to effectively manage odors in the collection system.
- Provide a proactive systematic approach to odor prevention and control through.
 - Monitoring the wastewater collection system and respond to odor complaints.
 - Improving the design of the sewer system and ensure hydrogen sulfide levels and air pressure in sewers to determine the quantity and quality of sewer venting gas.
 - Collect and test samples to determine the characteristics of the sewage.
 - Installing/building odor-control units/facilities and analyzing all data and information collected and determine the causes of the odors.

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- Dosing selected pipelines with chemicals to eliminate components that lead to odors and.
- Investigating new technologies to identify better materials or processes to control manage, mitigate, or eliminate odors.
- Special purpose Vehicle formed for IURWTS project keeping the community informed through public outreach efforts such as attending community meetings and distributing informative literature.
- Implement the recommendations through the operation and maintenance program.



8.5.1 Odor Control Measures proposed

Various measures proposed to reduce the generation and release of odours from the sewer system. They include:

- odor complaint response and investigation.
- routine sewer maintenance.
- chemical addition.
- air withdrawal and treatment from the collection system.
- Monitoring of sewer air pressure and odor concentration.

8.6 Mandatory Clearance



The project would need the clearance from GOK, KSPCB. and final EIA and CRZ clearance from MoEF&CC. Govt of India. Clearance from the Kerala State Pollution Control Board under the Air Act, the Water Act and CESS Act, if stipulated by the State Pollution Control Board (PCB) while giving the NOC. Kerala Water Authority has already obtained the sanction for setting up the sewerage plant and permission for discharging the treated effluent into the nearby water body adhering to the water quality standards prescribed by PCB. The clearance obtained is enclosed as **Annexure 7**.

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9. Implementation schedule



IMPLEMENTATION SCHEDULE FOR CONSTRUCTION OF ELAMKULAM STP AND SEWER NETWORK																																	
SI No	Description	Task Duration (in days)	Start Date	End Date	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24	
1	Tendering process	30	01-09-2022	30-09-2022																													
2	Award of work	30	01-10-2022	31-10-2022																													
3	Mobilization for STP and Sewer network	60	01-11-2022	31-12-2022																													
4	Detailed Design Phase	120	01-11-2022	01-03-2023																													
5	Validation of Design by GC	120	01-12-2022	30-03-2023																													
6	Construction of Sewer lines	545	31-12-2022	27-06-2024																													
7	Construction of Manholes and Lifting Stations	545	31-12-2022	27-06-2024																													
8	Household connections	180	01-11-2023	29-04-2024																													
9	Construction of STP civil structues	180	01-04-2023	28-09-2023																													
10	MEP installations for STP and SCADA systems	180	01-10-2023	29-03-2024																													
11	Final checking and rectification of the defects	60	29-03-2024	28-05-2024																													
12	Commissioning of STP and Sewer net	60	01-06-2024	31-07-2024																													

Note: O&M period will be 10 years from the completion of work.

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ANNEXURE 1

POPULATION PROJECTION

(CERTIFIED BY KWA / KMRL)

Consultant:



ANNEXURE 1 POPULATION PROJECTION
(CERTIFIED BY KWA / KMRL)

Project:

IURWTS

Client:



EXPECTED SEWER LOAD CALCULATION FOR KOCHI CORPORATION

Return ratio	0.85																			
Infiltration of ground water	4500																			
Storm water flow	(accounted in return ratio)																			
Sewer load in year end	2020	2021	2025	2035	2040	2050	2055													
Sewer load in Western Kochi	52.96	53.23	54.30	57.09	58.55	60.28	63.19													
Sewer load in Mainland	73.20	73.57	75.05	80.92	80.92	86.18	87.33													
Total	126.17	126.80	129.35	138.01	139.47	146.46	150.52													

VENNALA ZONE

SL NO.	DIVISION	sewer load in year end			2020			2021			2025			2035			2040			2050			2055		
		TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA
38 (75%)	75%	42%	33%	DEVANKULANGARA	1.29	0.72	0.57	1.30	0.73	0.57	1.32	0.74	0.58	1.39	0.78	0.61	1.43	0.80	0.63	1.52	0.85	0.67	1.54	0.86	0.68
40 (73%)	73%	40%	33%	MAMANGALAM	1.01	0.55	0.46	1.01	0.55	0.46	1.03	0.57	0.47	1.08	0.59	0.49	1.11	0.61	0.50	1.19	0.65	0.54	1.20	0.66	0.54
41 (100%)	100%	79%	21%	PADIVATTOM	1.45	1.14	0.30	1.46	1.15	0.31	1.49	1.17	0.31	1.56	1.23	0.33	1.60	1.27	0.34	1.71	1.35	0.36	1.73	1.37	0.36
42 (100%)	100%	95.5%	4.5%	VENNALA	1.92	1.84	0.09	1.93	1.84	0.09	1.97	1.88	0.09	2.07	1.98	0.09	2.12	2.03	0.10	2.26	2.16	0.10	2.29	2.19	0.10
46 (100%)	100%	43%	57%	CHAKKARAPARAMBU	1.98	0.85	1.13	1.99	0.86	1.13	2.03	0.87	1.16	2.13	0.92	1.22	2.19	0.94	1.25	2.33	1.00	1.33	2.36	1.02	1.35
47 (100%)	100%	61%	39%	CHALIKKAVATTOM	1.31	0.80	0.51	1.31	0.80	0.51	1.34	0.82	0.52	1.41	0.86	0.55	1.44	0.88	0.56	1.54	0.94	0.60	1.56	0.95	0.61
48 (75%)	75%		75%	PONNURUNNI EAST	0.89	0.00	0.89	0.89	0.00	0.89	0.91	0.00	0.91	0.96	0.00	0.96	0.98	0.00	0.98	1.04	0.00	1.04	1.06	0.00	1.06
				TOTAL	9.84	5.90	3.94	9.89	5.93	3.96	10.09	6.05	4.04	10.61	6.36	4.24	10.88	6.52	4.35	11.58	6.95	4.64	11.74	7.04	4.70

MUTTAR ZONE

SL NO.	DIVISION	sewer load in year end			2020			2021			2025			2035			2040			2050			2055		
		TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA
33 (43%)	43%	43%		ELAMAKARA NORTH	0.73	0.73	0.00	0.74	0.74	0.00	0.75	0.75	0.00	0.79	0.79	0.00	0.81	0.81	0.00	0.86	0.86	0.00	0.87	0.87	0.00
34 (47%)	47%	47%		PUTHUKKALAVATTOM	0.85	0.85	0.00	0.85	0.85	0.00	0.87	0.87	0.00	0.91	0.91	0.00	0.93	0.93	0.00	1.00	1.00	0.00	1.01	1.01	0.00
35 (100%)	100%	100%		PONEKKARA	1.74	1.74	0.00	1.75	1.75	0.00	1.79	1.79	0.00	1.88	1.88	0.00	1.93	1.93	0.00	2.05	2.05	0.00	2.08	2.08	0.00
36 (100%)	100%	18%	82%	KUNNUMPURAM	1.51	0.27	1.24	1.52	0.27	1.25	1.55	0.28	1.27	1.63	0.29	1.34	1.67	0.30	1.37	1.78	0.32	1.46	1.80	0.32	1.48
37 (100%)	100%	100%		EDAPPILLY	1.83	1.83	0.00	1.84	1.84	0.00	1.87	1.87	0.00	1.97	1.97	0.00	2.02	2.02	0.00	2.15	2.15	0.00	2.18	2.18	0.00
38 (25%)	25%	25%		DEVANKULANGARA	0.43	0.43	0.00	0.43	0.43	0.00	0.44	0.44	0.00	0.46	0.46	0.00	0.48	0.48	0.00	0.51	0.51	0.00	0.51	0.51	0.00
39 (59%)	59%	59%		KARUKAPPILLY	1.08	1.08	0.00	1.08	1.08	0.00	1.10	1.10	0.00	1.16	1.16	0.00	1.19	1.19	0.00	1.27	1.27	0.00	1.28	1.28	0.00
40 (27%)	27%	27%		MAMANGALAM	0.37	0.37	0.00	0.37	0.37	0.00	0.38	0.38	0.00	0.40	0.40	0.00	0.41	0.41	0.00	0.44	0.44	0.00	0.44	0.44	0.00
70 (25%)	25%	25%		KALOOR NORTH	0.51	0.51	0.00	0.51	0.51	0.00	0.52	0.52	0.00	0.55	0.55	0.00	0.56	0.56	0.00	0.60	0.60	0.00	0.60	0.60	0.00
71 (53%)	53%	53%		ELAMAKKARA SOUTH	0.91	0.91	0.00	0.91	0.91	0.00	0.93	0.93	0.00	0.98	0.98	0.00	1.00	1.00	0.00	1.07	1.07	0.00	1.08	1.08	0.00
72 (49%)	49%	49%		POTTAKKUZHY	0.70	0.70	0.00	0.70	0.70	0.00	0.72	0.72	0.00	0.75	0.75	0.00	0.77	0.77	0.00	0.82	0.82	0.00	0.83	0.83	0.00
				TOTAL	10.65	9.41	1.24	10.70	9.46	1.25	10.92	9.65	1.27	11.48	10.14	1.34	11.77	10.40	1.37	12.54	11.08	1.46	12.71	11.23	1.48

PERANDOOR ZONE

SL NO.	DIVISION	sewer load in year end			2020			2021			2025			2035			2040			2050			2055		
		TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA
32 (28%)	28%	28%		VADUTHALA EAST	0.43	0.43	0.00	0.44	0.44	0.00	0.45	0.45	0.00	0.47	0.47	0.00	0.48	0.48	0.00	0.51	0.51	0.00	0.52	0.52	0.00
33 (57%)	57%	57%		ELAMAKARA NORTH	0.97	0.97	0.00	0.98	0.98	0.00	0.99	0.99	0.00	1.05	1.05	0.00	1.07	1.07	0.00	1.14	1.14	0.00	1.16	1.16	0.00
34 (53%)	53%	24%	29%	PUTHUKKALAVATTOM	0.95	0.43	0.52	0.96	0.43	0.52	0.98	0.44	0.53	1.03	0.47	0.56	1.05	0.48	0.58	1.12	0.51	0.61	1.14	0.52	0.62
65 (15%)	15%	15%		KALOOR SOUTH	0.24	0.24	0.00	0.24	0.24	0.00	0.24	0.24	0.00	0.25	0.25	0.00	0.26	0.26	0.00	0.28	0.28	0.00	0.28	0.28	0.00
69 (46%)	46%	46%		THRIKKANARVATTOM	0.83	0.83	0.00	0.83	0.83	0.00	0.85	0.85	0.00	0.89	0.89	0.00	0.91	0.91	0.00	0.97	0.97	0.00	0.99	0.99	0.00
70 (75%)	75%	75%		KALOOR NORTH	1.52	1.52	0.00	1.53	1.53	0.00	1.56	1.56	0.00	1.64	1.64	0.00	1.68	1.68	0.00	1.79	1.79	0.00	1.81	1.81	0.00
71 (47%)	47%	47%		ELAMAKKARA SOUTH	0.80	0.80	0.00	0.81	0.81	0.00	0.82	0.82	0.00	0.87	0.87	0.00	0.89	0.89	0.00	0.95	0.95	0.00	0.96	0.96	0.00
72 (51%)	51%	51%		POTTAKKUZHY	0.73	0.73	0.00	0.73	0.73	0.00	0.74	0.74	0.00	0.78	0.78	0.00	0.80	0.80	0.00	0.85	0.85	0.00	0.87	0.87	0.00
73 (88%)	88%	88%		PACHALAM	1.80	1.80	0.00	1.81	1.81	0.00	1.84	1.84	0.00	1.94	1.94	0.00	1.99	1.99	0.00	2.12	2.12	0.00	2.15	2.15	0.00
				TOTAL	8.27	7.75	0.52	8.31	7.78	0.52	8.48	7.94	0.53	8.91	8.35	0.56	9.14	8.56	0.58	9.73	9.12	0.61	9.87	9.24	0.62

VADUTHALA ZONE

SL NO.	DIVISION	sewer load in year end			20
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SEPTAGE ZONE																									
				sewer load in year end	2020			2021			2025			2035			2040			2050			2055		
		TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA
SL NO.	DIVISION				NAME																				
1	50 (100%)	100%			CHAMBAKARA	1.41	1.41	1.42		1.42	1.45		1.45	1.52		1.52	1.56		1.56	1.66		1.66	1.68		1.68
2	51 (60%)	60%			POONITHURA	0.90	0.90	0.90		0.90	0.92		0.92	0.97		0.97	0.99		0.99	1.06		1.06	1.07		1.07
					TOTAL	2.31	2.31	2.32		2.32	2.37		2.37	2.49		2.49	2.55		2.55	2.72		2.72	2.76		2.76
ELAMKULAM ZONE																									
				sewer load in year end	2020			2021			2025			2035			2040			2050			2055		
		TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA
SL NO.	DIVISION				NAME																				
1	39 (41%)	41%	41%		KARUKAPPILLY	0.75	0.75	0.00	0.75	0.75	0.00	0.77	0.77	0.00	0.81	0.81	0.00	0.83	0.83	0.00	0.88	0.88	0.00	0.89	0.89
2	43 (100%)	100%		100%	PALARIVATTOM	1.93	0.00	1.93	1.94	0.00	1.94	1.98	0.00	1.98	2.08	0.00	2.08	2.14	0.00	2.14	2.28	0.00	2.28	2.31	0.00
3	44 (100%)	100%	53%	47%	KARANAKKODAM	1.86	0.99	0.88	1.87	0.99	0.88	1.91	1.01	0.90	2.01	1.06	0.94	2.06	1.09	0.97	2.19	1.16	1.03	2.22	1.18
4	45 (100%)	100%	24%	76%	THAMMANAM	1.71	0.41	1.30	1.72	0.41	1.31	1.75	0.42	1.33	1.84	0.44	1.40	1.89	0.45	1.44	2.01	0.48	1.53	2.04	0.49
5	48 (25%)	25%		25%	PONNURUNNI EAST	0.30	0.00	0.30	0.30	0.00	0.30	0.30	0.00	0.30	0.32	0.00	0.32	0.33	0.00	0.33	0.35	0.00	0.35	0.35	0.00
6	49 (100%)	100%		100%	VYTTILA	1.28	0.00	1.28	1.29	0.00	1.29	1.31	0.00	1.31	1.38	0.00	1.38	1.42	0.00	1.42	1.51	0.00	1.51	1.53	0.00
7	51 (40%)	40%		40%	POONITHURA	0.60	0.00	0.60	0.60	0.00	0.60	0.61	0.00	0.61	0.65	0.00	0.65	0.66	0.00	0.66	0.71	0.00	0.71	0.71	0.00
8	52 (100%)	100%	58%	42%	VYTTILA JANATHA	1.80	1.04	0.75	1.81	1.05	0.76	1.84	1.07	0.77	1.93	1.12	0.81	1.98	1.15	0.83	2.11	1.22	0.89	2.14	1.24
9	53 (100%)	100%	55%	45%	PONNURUNNI	1.78	0.98	0.80	1.79	0.98	0.80	1.82	1.00	0.82	1.92	1.05	0.86	1.97	1.08	0.89	2.09	1.15	0.94	2.12	1.17
10	54 (100%)	100%		100%	ELAMKULAM	2.14	0.00	2.14	2.15	0.00	2.15	2.19	0.00	2.19	2.30	0.00	2.30	2.36	0.00	2.36	2.51	0.00	2.51	2.55	0.00
11	55 (100%)	100%	70%	30%	GIRINAGAR	1.36	0.95	0.41	1.36	0.95	0.41	1.39	0.97	0.42	1.46	1.02	0.44	1.50	1.05	0.45	1.60	1.12	0.48	1.62	1.13
12	56 (100%)	100%	85%	15%	PANAMPILLY NAGAR	1.56	1.33	0.23	1.57	1.34	0.24	1.60	1.36	0.24	1.68	1.43	0.25	1.73	1.47	0.26	1.84	1.56	0.28	1.86	1.59
13	57 (100%)	100%	26%	74%	KADAVANTHRA	2.24	0.58	1.66	2.25	0.59	1.67	2.30	0.60	1.70	2.42	0.63	1.79	2.48	0.64	1.84	2.64	0.69	1.95	2.68	0.70
14	58 (100%)	100%		100%	KONTHURUTHY	1.58	0.00	1.58	1.59	0.00	1.59	1.62	0.00	1.62	1.70	0.00	1.70	1.75	0.00	1.75	1.86	0.00	1.86	1.88	0.00
15	59 (100%)	100%		100%	THEVARA	1.30	0.00	1.30	1.31	0.00	1.31	1.33	0.00	1.33	1.40	0.00	1.40	1.43	0.00	1.43	1.52	0.00	1.52	1.54	0.00
16	60 (100%)	100%	61%	39%	PERUMANOOR	1.99	1.21	0.77	2.00	1.22	0.78	2.04	1.24	0.79	2.14	1.31	0.83	2.20	1.34	0.86	2.34	1.43	0.91	2.37	1.45
17	61 (100%)	100%		100%	RAVIPURAM	1.18	0.00	1.18	1.19	0.00	1.19	1.21	0.00	1.21	1.28	0.00	1.28	1.31	0.00	1.31	1.39	0.00	1.39	1.41	0.00
18	62 (100%)	100%	18%	82%	ERNAKULAM SOUTH	1.48	0.27	1.21	1.48	0.27	1.22	1.51	0.27	1.24	1.59	0.29	1.30	1.63	0.29	1.34	1.74	0.31	1.42	1.76	0.32
19	63 (100%)	100%	68%	32%	GANDHINAGAR	1.74	1.18	0.56	1.75	1.19	0.56	1.78	1.21	0.57	1.87	1.27	0.60	1.92	1.31	0.61	2.04	1.39	0.65	2.07	1.41
20	64 (100%)	100%		100%	KATHRIKADAV	2.00	2.00	0.00	2.01	2.01	0.00	2.05	2.05	0.00	2.16	2.16	0.00	2.21	2.21	0.00	2.36	2.36	0.00	2.39	2.39
21	65 (85%)	85%	85%		KALOOR SOUTH	1.34	1.34	0.00	1.34	1.34	0.00	1.37	1.37	0.00	1.44	1.44	0.00	1.48	1.48	0.00	1.57	1.57	0.00	1.59	1.59
22	66 (100%)	100%	24%	76%	ERNAKULAM CENTRAL	1.74	0.42	1.32	1.75	0.42	1.33	1.78	0.43	1.36	1.87	0.45	1.42	1.92	0.46	1.46	2.05	0.49	1.56	2.08	0.50
23	67 (60%)	60%		60%	ERNAKULAM NORTH	0.71	0.00	0.71	0.71	0.00	0.71	0.72	0.00	0.72	0.76	0.00	0.76	0.78	0.00	0.78	0.83	0.00	0.83	0.84	0.00
					TOTAL	34.35	13.44	20.20	33.81	13.51	20.30	35.21	13.78	20.71	36.25	14.48	21.77	37.18	14.85	22.33	39.59	15.82	23.78	40.96	16.03
																					TOTAL	KMRL	KWA		
																					87.33	43.54	43.79		
																					87.33				

Verified the population projection and sewage load calculation and found correct based on Sewerage Master Plan prepared for Kochi Corporation

Executive Engineer
Sewerage Circle
Kochi - 11

Kochi Metro Rail Limited
(Design)
General Manager
Kochi - 682017



No.	Name of ward	Population as per 2011 Census	% increase of population adopted	Anticipated population in 2020	domestic demand in MLD @ 150 LPCD	Floating demand @ 70 LPCD in 2020	domestic demand in MLD in 2020	Road length in km	Infiltration in MLD in 2020	Total sewer load in MLD in 2020 with RR	Anticipated population in 2021	domestic demand in MLD @ 150 LPCD	Floating demand @ 70 LPCD in 2021	domestic demand in MLD in 2021
1	FORTKOCHI	10271	6.03	10827	1.62	0.417	0.31	10.85	0.049	2.05	10891	1.63	0.419	0.31
2	KALVATHY	7811	6.03	8234	1.24	0.317	0.23	8.25	0.037	1.56	8282	1.24	0.319	0.23
3	ERAVELY	6425	6.03	6773	1.02	0.261	0.19	6.78	0.031	1.28	6813	1.02	0.262	0.19
4	KARIPALAM	8882	6.03	9363	1.40	0.360	0.27	9.38	0.042	1.77	9418	1.41	0.363	0.27
5	MATTANCHERY	10144	6.03	10693	1.60	0.412	0.30	10.71	0.048	2.02	10756	1.61	0.414	0.30
6	KOCHANGADY	7108	6.03	7493	1.12	0.288	0.21	7.51	0.034	1.42	7537	1.13	0.290	0.21
7	CHERLAI	7741	6.03	8160	1.22	0.314	0.23	8.17	0.037	1.54	8208	1.23	0.316	0.23
8	PANAYAPPILLY	11429	6.03	12048	1.81	0.464	0.34	12.07	0.054	2.28	12119	1.82	0.467	0.34
9	CHAKKAMADAM	5046	6.03	5319	0.80	0.205	0.15	5.33	0.024	1.00	5350	0.80	0.206	0.15
10	KARUVELIPADY	7643	6.03	8057	1.21	0.310	0.23	8.07	0.036	1.52	8104	1.22	0.312	0.23
11	THOPPUMPADY	9266	6.03	9768	1.47	0.376	0.28	9.78	0.044	1.85	9825	1.47	0.378	0.28
12	THAREBHAGAM	8925	6.03	9408	1.41	0.362	0.27	9.42	0.042	1.78	9463	1.42	0.364	0.27
13	KADEBAGAM	10203	6.03	10755	1.61	0.414	0.31	10.77	0.048	2.03	10819	1.62	0.417	0.31
14	THAZHUPPU	10699	6.03	11278	1.69	0.434	0.32	11.30	0.051	2.13	11345	1.70	0.437	0.32
15	EDAKOCHI NORTH	9574	6.03	10092	1.51	0.389	0.29	10.11	0.045	1.91	10152	1.52	0.391	0.29
16	EDAKOCHI SOUTH	7808	6.03	8231	1.23	0.317	0.23	8.24	0.037	1.55	8279	1.24	0.319	0.23
17	PERUMPADAPPU	9442	6.03	9953	1.49	0.383	0.28	9.97	0.045	1.88	10012	1.50	0.385	0.28
18	KONNAM	9863	6.03	10397	1.56	0.400	0.30	10.41	0.047	1.96	10458	1.57	0.403	0.30
19	PALLURUTHY KACHERIPADY	11100	6.03	11701	1.76	0.450	0.33	11.72	0.053	2.21	11770	1.77	0.453	0.33
20	NAMBIAPURAM	8748	6.03	9222	1.38	0.355	0.26	9.24	0.042	1.74	9276	1.39	0.357	0.26
21	PULLARDESAM	11046	6.03	11644	1.75	0.448	0.33	11.66	0.052	2.20	11712	1.76	0.451	0.33
22	MUNDAMVELY	14723	6.03	15520	2.33	0.598	0.44	15.55	0.070	2.93	15611	2.34	0.601	0.44
23	MANASSERY	8403	6.03	8858	1.33	0.341	0.25	8.87	0.040	1.67	8910	1.34	0.343	0.25
24	MULAMKKUZHV	8121	6.03	8561	1.28	0.330	0.24	8.58	0.039	1.62	8611	1.29	0.332	0.24
25	CHULLICKAL	6623	6.03	6982	1.05	0.269	0.20	6.99	0.031	1.32	7023	1.05	0.270	0.20
26	NAZERATH	7277	6.03	7671	1.15	0.295	0.22	7.68	0.035	1.45	7716	1.16	0.297	0.22
27	FORTKOCHI VELI	7456	6.03	7860	1.18	0.303	0.22	7.87	0.035	1.48	7906	1.19	0.304	0.22
28	AMARAVATHY	9439	6.03	9950	1.49	0.383	0.28	9.97	0.045	1.88	10008	1.50	0.385	0.28
29	ISLAND NORTH	4666	6.03	4919	0.74	0.189	0.14	4.93	0.022	0.93	4948	0.74	0.190	0.14
30	ISLAND SOUTH	10076	6.03	10622	1.59	0.409	0.30	10.64	0.048	2.01	10684	1.60	0.411	0.30
WESTERN KOCHI		265958.00		280359.00	42.05	10.79	7.98	280.84	1.26	52.96	282006.00	42.30	10.86	7.98
31	VADUTHALA WEST	9025	6.03	9514	1.43	0.366	0.27	9.53	0.043	1.80	9570	1.44	0.368	0.27
32	VADUTHALA EAST	7795	6.03	8217	1.23	0.316	0.23	8.23	0.037	1.55	8265	1.24	0.318	0.23
33	ELAMAKKARA NORTH	8547	6.03	9010	1.35	0.347	0.26	9.03	0.041	1.70	9063	1.36	0.349	0.26
34	PUTHUKKALAVATTOM	9034	6.03	9523	1.43	0.367	0.27	9.54	0.043	1.80	9579	1.44	0.369	0.27
35	PONEKKARA	8757	6.03	9231	1.38	0.355	0.26	9.25	0.042	1.74	9285	1.39	0.357	0.26
36	KUNNUPURAM	7589	6.03	8000	1.20	0.308	0.23	8.01	0.036	1.51	8047	1.21	0.310	0.23
37	EDAPPALLY	9183	6.03	9680	1.45	0.373	0.28	9.70	0.044	1.83	9737	1.46	0.375	0.28
38	DEVANKULNGARA	8634	6.03	9101	1.37	0.350	0.26	9.12	0.041	1.72	9155	1.37	0.352	0.26
39	KARUKAPPALLY	9166	6.03	9662	1.45	0.372	0.27	9.68	0.044	1.83	9719	1.46	0.374	0.27
40	MAMANGALAM	6924	6.03	7299	1.09	0.281	0.21	7.31	0.033	1.38	7342	1.10	0.283	0.21
41	PADIVATTOM	7277	6.03	7671	1.15	0.295	0.22	7.68	0.035	1.45	7716	1.16	0.297	0.22
42	VENNALA	9652	6.03	10175	1.53	0.392	0.29	10.19	0.046	1.92	10234	1.54	0.394	0.29



43	PALARIVATTOM	9708	6.03	10234	1.54	0.394	0.29	10.25	0.046	1.93	10294	1.54	0.396	0.29
44	KARANAKODAM	9354	6.03	9860	1.48	0.380	0.28	9.88	0.044	1.86	9918	1.49	0.382	0.28
45	THAMMANAM	8582	6.03	9047	1.36	0.348	0.26	9.06	0.041	1.71	9100	1.37	0.350	0.26
46	CHAKKARAPARAMBU	9938	6.03	10476	1.57	0.403	0.30	10.49	0.047	1.98	10538	1.58	0.406	0.30
47	CHALIKKAVATTOM	6557	6.03	6912	1.04	0.266	0.20	6.92	0.031	1.31	6953	1.04	0.268	0.20
48	PONNURUNNI EAST	5943	6.03	6265	0.94	0.241	0.18	6.28	0.028	1.18	6302	0.95	0.243	0.18
49	VYTTILA	6428	6.03	6776	1.02	0.261	0.19	6.79	0.031	1.28	6816	1.02	0.262	0.19
50	CHAMBAKKARA	7091	6.03	7475	1.12	0.288	0.21	7.49	0.034	1.41	7519	1.13	0.289	0.21
51	POONITHURA	7524	6.03	7931	1.19	0.305	0.23	7.94	0.036	1.50	7978	1.20	0.307	0.23
52	VYTTILA JANATHA	9024	6.03	9513	1.43	0.366	0.27	9.53	0.043	1.80	9568	1.44	0.368	0.27
53	PONNURUNNI	8935	6.03	9419	1.41	0.363	0.27	9.43	0.042	1.78	9474	1.42	0.365	0.27
54	ELAMKULAM	10726	6.03	11307	1.70	0.435	0.32	11.33	0.051	2.14	11373	1.71	0.438	0.32
55	GIRINAGAR	6808	6.03	7177	1.08	0.276	0.20	7.19	0.032	1.36	7219	1.08	0.278	0.20
56	PANAPPILLY NAGAR	7849	6.03	8274	1.24	0.319	0.24	8.29	0.037	1.56	8323	1.25	0.320	0.24
57	KADAVANTHRA	11267	6.03	11877	1.78	0.457	0.34	11.90	0.054	2.24	11947	1.79	0.460	0.34
58	KONTHURUTHY	7933	6.03	8362	1.25	0.322	0.24	8.38	0.038	1.58	8412	1.26	0.324	0.24
59	THEVARA	6522	6.03	6875	1.03	0.265	0.20	6.89	0.031	1.30	6915	1.04	0.266	0.20
60	PERUMANOOR	9973	6.03	10513	1.58	0.405	0.30	10.53	0.047	1.99	10575	1.59	0.407	0.30
61	RAVIPURAM	5940	6.03	6262	0.94	0.241	0.18	6.27	0.028	1.18	6298	0.94	0.242	0.18
62	ERNAKULAM SOUTH	7407	6.03	7808	1.17	0.301	0.22	7.82	0.035	1.48	7854	1.18	0.302	0.22
63	GANDHI NAGAR	8721	6.03	9193	1.38	0.354	0.26	9.21	0.041	1.74	9247	1.39	0.356	0.26
64	KATHRIKADAVU	10047	6.03	10591	1.59	0.408	0.30	10.61	0.048	2.00	10653	1.60	0.410	0.30
65	KALOOR SOUTH	7887	6.03	8314	1.25	0.320	0.24	8.33	0.037	1.57	8363	1.25	0.322	0.24
66	ERNAKULAM CENTRAL	8734	6.03	9207	1.38	0.354	0.26	9.22	0.042	1.74	9261	1.39	0.357	0.26
67	ERNAKULAM NORTH	5914	6.03	6234	0.94	0.240	0.18	6.24	0.028	1.18	6271	0.94	0.241	0.18
68	AYYAPPANKAVU	5970	6.03	6293	0.94	0.242	0.18	6.30	0.028	1.19	6330	0.95	0.244	0.18
69	THRIKKANARVATTOM	9018	6.03	9506	1.43	0.366	0.27	9.52	0.043	1.80	9562	1.43	0.368	0.27
70	KLOOR NORTH	10174	6.03	10725	1.61	0.413	0.31	10.74	0.048	2.03	10788	1.62	0.415	0.31
71	ELAMAKKARA SOUTH	8585	6.03	9050	1.36	0.348	0.26	9.07	0.041	1.71	9103	1.37	0.350	0.26
72	POTTAKUZH	7148	6.03	7535	1.13	0.290	0.21	7.55	0.034	1.42	7579	1.14	0.292	0.21
73	PACHALAM	10262	6.03	10818	1.62	0.416	0.31	10.84	0.049	2.04	10881	1.63	0.419	0.31
74	THATTAZHAM	10043	6.03	10587	1.59	0.408	0.30	10.60	0.048	2.00	10649	1.60	0.410	0.30
ERNAKULAM		367595		387499	58.12	14.92	11.02	388.16	1.75	73.20	389775.00	58.47	15.01	11.02
Total of Kochi Corporation		633553		667858.00	100.18	25.71	19.00	669.00	3.01	126.17	671781.00	100.77	25.86	19.00



Road length in km	Infiltration in MLD in 2021	Total sewer load in MLD in 2021 with RR	Anticipated population in 2025	domestic demand in MLD @ 150 LPCD	Floating demand @ 70 LPCD in 2025	domestic demand in MLD in 2025	Road length in km	Infiltration in MLD in 2025	Total sewer load in MLD in 2025 with RR	Anticipated population in 2035	domestic demand in MLD @ 150 LPCD	Floating demand @ 70 LPCD in 2035	domestic demand in MLD in 2035	Road length in km	Infiltration in MLD in 2035
10.85	0.049	2.06	11149	1.67	0.429	0.31	10.85	0.049	2.10	11822	1.77	0.455	0.31	10.85	0.049
8.25	0.037	1.56	8479	1.27	0.326	0.23	8.25	0.037	1.59	8990	1.35	0.346	0.23	8.25	0.037
6.78	0.031	1.29	6974	1.05	0.269	0.19	6.78	0.031	1.31	7395	1.11	0.285	0.19	6.78	0.031
9.38	0.042	1.78	9641	1.45	0.371	0.27	9.38	0.042	1.81	10223	1.53	0.394	0.27	9.38	0.042
10.71	0.048	2.03	11011	1.65	0.424	0.30	10.71	0.048	2.07	11675	1.75	0.449	0.30	10.71	0.048
7.51	0.034	1.42	7716	1.16	0.297	0.21	7.51	0.034	1.45	8181	1.23	0.315	0.21	7.51	0.034
8.17	0.037	1.55	8403	1.26	0.324	0.23	8.17	0.037	1.58	8910	1.34	0.343	0.23	8.17	0.037
12.07	0.054	2.29	12406	1.86	0.478	0.34	12.07	0.054	2.33	13154	1.97	0.506	0.34	12.07	0.054
5.33	0.024	1.01	5477	0.82	0.211	0.15	5.33	0.024	1.03	5808	0.87	0.224	0.15	5.33	0.024
8.07	0.036	1.53	8296	1.24	0.319	0.23	8.07	0.036	1.56	8797	1.32	0.339	0.23	8.07	0.036
9.78	0.044	1.85	10058	1.51	0.387	0.28	9.78	0.044	1.89	10665	1.60	0.411	0.28	9.78	0.044
9.42	0.042	1.79	9688	1.45	0.373	0.27	9.42	0.042	1.82	10272	1.54	0.395	0.27	9.42	0.042
10.77	0.048	2.04	11075	1.66	0.426	0.31	10.77	0.048	2.08	11743	1.76	0.452	0.31	10.77	0.048
11.30	0.051	2.14	11613	1.74	0.447	0.32	11.30	0.051	2.18	12314	1.85	0.474	0.32	11.30	0.051
10.11	0.045	1.92	10392	1.56	0.400	0.29	10.11	0.045	1.95	11019	1.65	0.424	0.29	10.11	0.045
8.24	0.037	1.56	8475	1.27	0.326	0.23	8.24	0.037	1.59	8987	1.35	0.346	0.23	8.24	0.037
9.97	0.045	1.89	10249	1.54	0.395	0.28	9.97	0.045	1.93	10867	1.63	0.418	0.28	9.97	0.045
10.41	0.047	1.97	10706	1.61	0.412	0.30	10.41	0.047	2.01	11352	1.70	0.437	0.30	10.41	0.047
11.72	0.053	2.22	12049	1.81	0.464	0.33	11.72	0.053	2.27	12776	1.92	0.492	0.33	11.72	0.053
9.24	0.042	1.75	9496	1.42	0.366	0.26	9.24	0.042	1.79	10069	1.51	0.388	0.26	9.24	0.042
11.66	0.052	2.21	11990	1.80	0.462	0.33	11.66	0.052	2.26	12714	1.91	0.489	0.33	11.66	0.052
15.55	0.070	2.95	15981	2.40	0.615	0.44	15.55	0.070	3.01	16946	2.54	0.652	0.44	15.55	0.070
8.87	0.040	1.68	9121	1.37	0.351	0.25	8.87	0.040	1.72	9672	1.45	0.372	0.25	8.87	0.040
8.58	0.039	1.63	8815	1.32	0.339	0.24	8.58	0.039	1.66	9347	1.40	0.360	0.24	8.58	0.039
6.99	0.031	1.33	7189	1.08	0.277	0.20	6.99	0.031	1.35	7623	1.14	0.293	0.20	6.99	0.031
7.68	0.035	1.46	7899	1.18	0.304	0.22	7.68	0.035	1.49	8376	1.26	0.322	0.22	7.68	0.035
7.87	0.035	1.49	8093	1.21	0.312	0.22	7.87	0.035	1.52	8582	1.29	0.330	0.22	7.87	0.035
9.97	0.045	1.89	10246	1.54	0.394	0.28	9.97	0.045	1.93	10864	1.63	0.418	0.28	9.97	0.045
4.93	0.022	0.93	5065	0.76	0.195	0.14	4.93	0.022	0.95	5370	0.81	0.207	0.14	4.93	0.022
10.64	0.048	2.02	10937	1.64	0.421	0.30	10.64	0.048	2.06	11597	1.74	0.446	0.30	10.64	0.048
280.84	1.26	53.23	288689.00	43.30	11.11	7.98	280.84	1.26	54.30	306110.00	45.92	11.79	7.98	280.84	1.26
9.53	0.043	1.81	9796	1.47	0.377	0.27	9.53	0.043	1.84	10387	1.56	0.400	0.27	9.53	0.043
8.23	0.037	1.56	8461	1.27	0.326	0.23	8.23	0.037	1.59	8972	1.35	0.345	0.23	8.23	0.037
9.03	0.041	1.71	9278	1.39	0.357	0.26	9.03	0.041	1.75	9837	1.48	0.379	0.26	9.03	0.041
9.54	0.043	1.81	9806	1.47	0.378	0.27	9.54	0.043	1.84	10398	1.56	0.400	0.27	9.54	0.043
9.25	0.042	1.75	9505	1.43	0.366	0.26	9.25	0.042	1.79	10079	1.51	0.388	0.26	9.25	0.042
8.01	0.036	1.52	8238	1.24	0.317	0.23	8.01	0.036	1.55	8735	1.31	0.336	0.23	8.01	0.036
9.70	0.044	1.84	9968	1.50	0.384	0.28	9.70	0.044	1.87	10569	1.59	0.407	0.28	9.70	0.044
9.12	0.041	1.73	9372	1.41	0.361	0.26	9.12	0.041	1.76	9937	1.49	0.383	0.26	9.12	0.041
9.68	0.044	1.83	9949	1.49	0.383	0.27	9.68	0.044	1.87	10550	1.58	0.406	0.27	9.68	0.044
7.31	0.033	1.39	7516	1.13	0.289	0.21	7.31	0.033	1.41	7969	1.20	0.307	0.21	7.31	0.033
7.68	0.035	1.46	7899	1.18	0.304	0.22	7.68	0.035	1.49	8376	1.26	0.322	0.22	7.68	0.035
10.19	0.046	1.93	10477	1.57	0.403	0.29	10.19	0.046	1.97	11109	1.67	0.428	0.29	10.19	0.046



10.25	0.046	1.94	10538	1.58	0.406	0.29	10.25	0.046	1.98	11174	1.68	0.430	0.29	10.25	0.046
9.88	0.044	1.87	10154	1.52	0.391	0.28	9.88	0.044	1.91	10766	1.61	0.414	0.28	9.88	0.044
9.06	0.041	1.72	9316	1.40	0.359	0.26	9.06	0.041	1.75	9878	1.48	0.380	0.26	9.06	0.041
10.49	0.047	1.99	10787	1.62	0.415	0.30	10.49	0.047	2.03	11438	1.72	0.440	0.30	10.49	0.047
6.92	0.031	1.31	7117	1.07	0.274	0.20	6.92	0.031	1.34	7547	1.13	0.291	0.20	6.92	0.031
6.28	0.028	1.19	6451	0.97	0.248	0.18	6.28	0.028	1.21	6840	1.03	0.263	0.18	6.28	0.028
6.79	0.031	1.29	6977	1.05	0.269	0.19	6.79	0.031	1.31	7398	1.11	0.285	0.19	6.79	0.031
7.49	0.034	1.42	7697	1.15	0.296	0.21	7.49	0.034	1.45	8161	1.22	0.314	0.21	7.49	0.034
7.94	0.036	1.51	8167	1.23	0.314	0.23	7.94	0.036	1.54	8660	1.30	0.333	0.23	7.94	0.036
9.53	0.043	1.81	9795	1.47	0.377	0.27	9.53	0.043	1.84	10386	1.56	0.400	0.27	9.53	0.043
9.43	0.042	1.79	9699	1.45	0.373	0.27	9.43	0.042	1.82	10284	1.54	0.396	0.27	9.43	0.042
11.33	0.051	2.15	11643	1.75	0.448	0.32	11.33	0.051	2.19	12345	1.85	0.475	0.32	11.33	0.051
7.19	0.032	1.36	7390	1.11	0.285	0.20	7.19	0.032	1.39	7836	1.18	0.302	0.20	7.19	0.032
8.29	0.037	1.57	8520	1.28	0.328	0.24	8.29	0.037	1.60	9034	1.36	0.348	0.24	8.29	0.037
11.90	0.054	2.25	12230	1.83	0.471	0.34	11.90	0.054	2.30	12968	1.95	0.499	0.34	11.90	0.054
8.38	0.038	1.59	8611	1.29	0.332	0.24	8.38	0.038	1.62	9131	1.37	0.352	0.24	8.38	0.038
6.89	0.031	1.31	7079	1.06	0.273	0.20	6.89	0.031	1.33	7507	1.13	0.289	0.20	6.89	0.031
10.53	0.047	2.00	10825	1.62	0.417	0.30	10.53	0.047	2.04	11479	1.72	0.442	0.30	10.53	0.047
6.27	0.028	1.19	6448	0.97	0.248	0.18	6.27	0.028	1.21	6837	1.03	0.263	0.18	6.27	0.028
7.82	0.035	1.48	8040	1.21	0.310	0.22	7.82	0.035	1.51	8525	1.28	0.328	0.22	7.82	0.035
9.21	0.041	1.75	9466	1.42	0.364	0.26	9.21	0.041	1.78	10038	1.51	0.386	0.26	9.21	0.041
10.61	0.048	2.01	10906	1.64	0.420	0.30	10.61	0.048	2.05	11564	1.73	0.445	0.30	10.61	0.048
8.33	0.037	1.58	8561	1.28	0.330	0.24	8.33	0.037	1.61	9078	1.36	0.350	0.24	8.33	0.037
9.22	0.042	1.75	9481	1.42	0.365	0.26	9.22	0.042	1.78	10053	1.51	0.387	0.26	9.22	0.042
6.24	0.028	1.18	6419	0.96	0.247	0.18	6.24	0.028	1.21	6807	1.02	0.262	0.18	6.24	0.028
6.30	0.028	1.19	6480	0.97	0.249	0.18	6.30	0.028	1.22	6871	1.03	0.265	0.18	6.30	0.028
9.52	0.043	1.80	9789	1.47	0.377	0.27	9.52	0.043	1.84	10379	1.56	0.400	0.27	9.52	0.043
10.74	0.048	2.04	11044	1.66	0.425	0.31	10.74	0.048	2.08	11710	1.76	0.451	0.31	10.74	0.048
9.07	0.041	1.72	9319	1.40	0.359	0.26	9.07	0.041	1.75	9881	1.48	0.380	0.26	9.07	0.041
7.55	0.034	1.43	7759	1.16	0.299	0.21	7.55	0.034	1.46	8227	1.23	0.317	0.21	7.55	0.034
10.84	0.049	2.05	11139	1.67	0.429	0.31	10.84	0.049	2.10	11811	1.77	0.455	0.31	10.84	0.049
10.60	0.048	2.01	10901	1.64	0.420	0.30	10.60	0.048	2.05	11559	1.73	0.445	0.30	10.60	0.048
388.16	1.75	73.57	399013.00	59.85	15.36	11.02	388.16	1.75	75.05	423090	63.46	16.29	11.02	388.16	1.75
669.00	3.01	126.80	687702.00	103.16	25.712	19.00	669.00	3.01	129.35	729200	109.38	28.07	19.00	669.00	3.01



Total sewer load in MLD in 2035 with RR	Anticipated population in 2040	domestic demand in MLD @ 150 LPCD	Floating demand @ 70 LPCD in 2040	domestic demand in MLD in 204	Road length in km	Infiltration in MLD in 2040	Total sewer load in MLD in 2040with RR	Anticipated population in 2053	domestic demand in MLD @ 150 LPCD in	demand @ 70 LPCD in 2050	domestic demand in MLD in 2050	Road length in km	ation in MLD in	Total sewer load in MLD in 2050 with RR
2.20	12173	1.83	0.469	0.31	10.85	0.049	2.26	13136	1.97	0.50	0.31	10.85	0.049	2.41
1.68	9257	1.39	0.356	0.23	8.25	0.037	1.72	9990	1.50	0.38	0.23	8.25	0.037	1.83
1.38	7615	1.14	0.293	0.19	6.78	0.031	1.41	8217	1.23	0.31	0.19	6.78	0.031	1.51
1.91	10527	1.58	0.405	0.27	9.38	0.042	1.96	11360	1.70	0.43	0.27	9.38	0.042	2.08
2.18	12022	1.80	0.463	0.30	10.71	0.048	2.23	12974	1.95	0.49	0.30	10.71	0.048	2.38
1.53	8424	1.26	0.324	0.21	7.51	0.034	1.56	9091	1.36	0.34	0.21	7.51	0.034	1.67
1.66	9174	1.38	0.353	0.23	8.17	0.037	1.70	9900	1.49	0.37	0.23	8.17	0.037	1.81
2.45	13545	2.03	0.521	0.34	12.07	0.054	2.52	14617	2.19	0.55	0.34	12.07	0.054	2.68
1.08	5980	0.90	0.230	0.15	5.33	0.024	1.11	6454	0.97	0.24	0.15	5.33	0.024	1.18
1.64	9058	1.36	0.349	0.23	8.07	0.036	1.68	9775	1.47	0.37	0.23	8.07	0.036	1.79
1.99	10982	1.65	0.423	0.28	9.78	0.044	2.04	11851	1.78	0.45	0.28	9.78	0.044	2.17
1.92	10578	1.59	0.407	0.27	9.42	0.042	1.96	11415	1.71	0.43	0.27	9.42	0.042	2.09
2.19	12092	1.81	0.466	0.31	10.77	0.048	2.25	13049	1.96	0.49	0.31	10.77	0.048	2.39
2.30	12680	1.90	0.488	0.32	11.30	0.051	2.36	13684	2.05	0.52	0.32	11.30	0.051	2.51
2.06	11347	1.70	0.437	0.29	10.11	0.045	2.11	12245	1.84	0.46	0.29	10.11	0.045	2.24
1.68	9254	1.39	0.356	0.23	8.24	0.037	1.72	9986	1.50	0.38	0.23	8.24	0.037	1.83
2.03	11190	1.68	0.431	0.28	9.97	0.045	2.08	12076	1.81	0.46	0.28	9.97	0.045	2.21
2.12	11689	1.75	0.450	0.30	10.41	0.047	2.17	12614	1.89	0.48	0.30	10.41	0.047	2.31
2.38	13155	1.97	0.506	0.33	11.72	0.053	2.44	14197	2.13	0.54	0.33	11.72	0.053	2.60
1.88	10368	1.56	0.399	0.26	9.24	0.042	1.93	11188	1.68	0.42	0.26	9.24	0.042	2.05
2.37	13091	1.96	0.504	0.33	11.66	0.052	2.43	14127	2.12	0.53	0.33	11.66	0.052	2.59
3.16	17449	2.62	0.672	0.44	15.55	0.070	3.24	18830	2.82	0.71	0.44	15.55	0.070	3.45
1.80	9959	1.49	0.383	0.25	8.87	0.040	1.85	10747	1.61	0.41	0.25	8.87	0.040	1.97
1.74	9625	1.44	0.371	0.24	8.58	0.039	1.79	10386	1.56	0.39	0.24	8.58	0.039	1.90
1.42	7849	1.18	0.302	0.20	6.99	0.031	1.46	8471	1.27	0.32	0.20	6.99	0.031	1.55
1.56	8625	1.29	0.332	0.22	7.68	0.035	1.60	9307	1.40	0.35	0.22	7.68	0.035	1.71
1.60	8837	1.33	0.340	0.22	7.87	0.035	1.64	9536	1.43	0.36	0.22	7.87	0.035	1.75
2.03	11187	1.68	0.431	0.28	9.97	0.045	2.08	12072	1.81	0.46	0.28	9.97	0.045	2.21
1.00	5530	0.83	0.213	0.14	4.93	0.022	1.03	5968	0.90	0.23	0.14	4.93	0.022	1.09
2.16	11942	1.79	0.460	0.30	10.64	0.048	2.22	12887	1.93	0.49	0.30	10.64	0.048	2.36
57.09	315204	47.28	12.14	7.98	280.84	1.26	58.55	340150.00	51.02	12.87	7.98	280.84	1.26	62.35
1.94	10696	1.60	0.412	0.27	9.53	0.043	1.99	11543	1.73	0.44	0.27	9.53	0.043	2.12
1.67	9238	1.39	0.356	0.23	8.23	0.037	1.72	9970	1.50	0.38	0.23	8.23	0.037	1.83
1.83	10130	1.52	0.390	0.26	9.03	0.041	1.88	10931	1.64	0.41	0.26	9.03	0.041	2.00
1.94	10707	1.61	0.412	0.27	9.54	0.043	1.99	11554	1.73	0.44	0.27	9.54	0.043	2.12
1.88	10379	1.56	0.400	0.26	9.25	0.042	1.93	11200	1.68	0.42	0.26	9.25	0.042	2.05
1.63	8994	1.35	0.346	0.23	8.01	0.036	1.67	9706	1.46	0.37	0.23	8.01	0.036	1.78
1.97	10883	1.63	0.419	0.28	9.70	0.044	2.02	11745	1.76	0.44	0.28	9.70	0.044	2.15
1.85	10233	1.53	0.394	0.26	9.12	0.041	1.90	11043	1.66	0.42	0.26	9.12	0.041	2.02
1.97	10863	1.63	0.418	0.27	9.68	0.044	2.02	11723	1.76	0.44	0.27	9.68	0.044	2.15
1.49	8206	1.23	0.316	0.21	7.31	0.033	1.52	8856	1.33	0.34	0.21	7.31	0.033	1.62
1.56	8625	1.29	0.332	0.22	7.68	0.035	1.60	9307	1.40	0.35	0.22	7.68	0.035	1.71
2.07	11439	1.72	0.440	0.29	10.19	0.046	2.12	12345	1.85	0.47	0.29	10.19	0.046	2.26



2.08	11506	1.73	0.443	0.29	10.25	0.046	2.14	12416	1.86	0.47	0.29	10.25	0.046	2.28
2.01	11086	1.66	0.427	0.28	9.88	0.044	2.06	11963	1.79	0.45	0.28	9.88	0.044	2.19
1.84	10171	1.53	0.392	0.26	9.06	0.041	1.89	10976	1.65	0.42	0.26	9.06	0.041	2.01
2.13	11778	1.77	0.453	0.30	10.49	0.047	2.19	12710	1.91	0.48	0.30	10.49	0.047	2.33
1.41	7771	1.17	0.299	0.20	6.92	0.031	1.44	8386	1.26	0.32	0.20	6.92	0.031	1.54
1.28	7044	1.06	0.271	0.18	6.28	0.028	1.31	7601	1.14	0.29	0.18	6.28	0.028	1.39
1.38	7618	1.14	0.293	0.19	7.84	0.035	1.42	8221	1.23	0.31	0.19	7.84	0.035	1.51
1.52	8404	1.26	0.324	0.21	7.49	0.034	1.56	9069	1.36	0.34	0.21	7.49	0.034	1.66
1.62	8917	1.34	0.343	0.23	7.94	0.036	1.66	9623	1.44	0.36	0.23	7.94	0.036	1.76
1.93	10695	1.60	0.412	0.27	8.47	0.038	1.98	11541	1.73	0.44	0.27	8.47	0.038	2.11
1.92	10590	1.59	0.408	0.27	9.43	0.042	1.97	11428	1.71	0.43	0.27	9.43	0.042	2.09
2.30	12712	1.91	0.489	0.32	11.33	0.051	2.36	13718	2.06	0.52	0.32	11.33	0.051	2.51
1.46	8069	1.21	0.311	0.20	7.19	0.032	1.50	8707	1.31	0.33	0.20	7.19	0.032	1.60
1.68	9302	1.40	0.358	0.24	8.29	0.037	1.73	10039	1.51	0.38	0.24	8.29	0.037	1.84
2.42	13353	2.00	0.514	0.34	11.90	0.054	2.48	14410	2.16	0.55	0.34	11.90	0.054	2.64
1.70	9402	1.41	0.362	0.24	8.38	0.038	1.75	10146	1.52	0.38	0.24	8.38	0.038	1.86
1.40	7730	1.16	0.298	0.20	5.83	0.026	1.43	8341	1.25	0.32	0.20	5.83	0.026	1.52
2.14	11820	1.77	0.455	0.30	10.53	0.047	2.20	12755	1.91	0.48	0.30	10.53	0.047	2.34
1.28	7040	1.06	0.271	0.18	6.27	0.028	1.31	7597	1.14	0.29	0.18	6.27	0.028	1.39
1.59	8779	1.32	0.338	0.22	7.82	0.035	1.63	9473	1.42	0.36	0.22	7.82	0.035	1.74
1.87	10336	1.55	0.398	0.26	9.21	0.041	1.92	11154	1.67	0.42	0.26	9.21	0.041	2.04
2.16	11907	1.79	0.458	0.30	10.61	0.048	2.21	12850	1.93	0.49	0.30	10.61	0.048	2.36
1.69	9347	1.40	0.360	0.24	8.33	0.037	1.74	10087	1.51	0.38	0.24	8.33	0.037	1.85
1.87	10351	1.55	0.399	0.26	9.22	0.042	1.92	11170	1.68	0.42	0.26	9.22	0.042	2.05
1.26	7009	1.05	0.270	0.18	4.66	0.021	1.29	7564	1.13	0.29	0.18	4.66	0.021	1.38
1.28	7076	1.06	0.272	0.18	6.30	0.028	1.31	7635	1.15	0.29	0.18	6.30	0.028	1.40
1.94	10688	1.60	0.411	0.27	9.52	0.043	1.99	11534	1.73	0.44	0.27	9.52	0.043	2.11
2.18	12058	1.81	0.464	0.31	10.74	0.048	2.24	13012	1.95	0.49	0.31	10.74	0.048	2.39
1.84	10175	1.53	0.392	0.26	9.07	0.041	1.89	10980	1.65	0.42	0.26	9.07	0.041	2.01
1.53	8472	1.27	0.326	0.21	7.55	0.034	1.57	9142	1.37	0.35	0.21	7.55	0.034	1.68
2.21	12162	1.82	0.468	0.31	11.36	0.051	2.26	13125	1.97	0.50	0.31	11.36	0.051	2.41
2.17	11903	1.79	0.458	0.30	12.72	0.057	2.22	12845	1.93	0.49	0.30	12.72	0.057	2.36
78.91	435664	65.35	16.77	11.02	388.16	1.75	80.92	470141	70.52	17.79	11.02	388.16	1.75	86.18
136.00	750868.00	112.63	28.91	19.00	669.00	3.01	139.47	810291.00	121.54	30.65	19.00	669.00	3.01	148.53




Anticipated population in 2055	domestic demand in MLD @ 150 LPCD in	demand @ 70 LPCD in 2050	domestic demand in MLD in 2055	Road length in km	ation in MLD in	Total sewer load in MLD in 2055 with RR
13291	1.99	0.51	0.31	10.85	0.049	2.44
10108	1.52	0.39	0.23	8.25	0.037	1.86
8314	1.25	0.32	0.19	6.78	0.031	1.53
11494	1.72	0.44	0.27	9.38	0.042	2.11
13127	1.97	0.51	0.30	10.71	0.048	2.41
9198	1.38	0.35	0.21	7.51	0.034	1.69
10017	1.50	0.39	0.23	8.17	0.037	1.84
14790	2.22	0.57	0.34	12.07	0.054	2.72
6530	0.98	0.25	0.15	5.33	0.024	1.20
9890	1.48	0.38	0.23	8.07	0.036	1.82
11991	1.80	0.46	0.28	9.78	0.044	2.20
11549	1.73	0.44	0.27	9.42	0.042	2.12
13203	1.98	0.51	0.31	10.77	0.048	2.42
13845	2.08	0.53	0.32	11.30	0.051	2.54
12389	1.86	0.48	0.29	10.11	0.045	2.27
10104	1.52	0.39	0.23	8.24	0.037	1.86
12218	1.83	0.47	0.28	9.97	0.045	2.24
12763	1.91	0.49	0.30	10.41	0.047	2.34
14364	2.15	0.55	0.33	11.72	0.053	2.64
11320	1.70	0.44	0.26	9.24	0.042	2.08
14294	2.14	0.55	0.33	11.66	0.052	2.62
19052	2.86	0.73	0.44	15.55	0.070	3.50
10874	1.63	0.42	0.25	8.87	0.040	2.00
10509	1.58	0.40	0.24	8.58	0.039	1.93
8570	1.29	0.33	0.20	6.99	0.031	1.57
9417	1.41	0.36	0.22	7.68	0.035	1.73
9648	1.45	0.37	0.22	7.87	0.035	1.77
12214	1.83	0.47	0.28	9.97	0.045	2.24
6038	0.91	0.23	0.14	4.93	0.022	1.11
13039	1.96	0.50	0.30	10.64	0.048	2.39
344160.00	51.62	13.25	7.98	280.84	1.26	63.19
11679	1.75	0.45	0.27	9.53	0.043	2.14
10087	1.51	0.39	0.23	8.23	0.037	1.85
11060	1.66	0.43	0.26	9.03	0.041	2.03
11690	1.75	0.45	0.27	9.54	0.043	2.15
11332	1.70	0.44	0.26	9.25	0.042	2.08
9820	1.47	0.38	0.23	8.01	0.036	1.80
11883	1.78	0.46	0.28	9.70	0.044	2.18
11173	1.68	0.43	0.26	9.12	0.041	2.05
11861	1.78	0.46	0.27	9.68	0.044	2.18
8960	1.34	0.34	0.21	7.31	0.033	1.65
9417	1.41	0.36	0.22	7.68	0.035	1.73
12490	1.87	0.48	0.29	10.19	0.046	2.29



12563	1.88	0.48	0.29	10.25	0.046	2.31
12104	1.82	0.47	0.28	9.88	0.044	2.22
11105	1.67	0.43	0.26	9.06	0.041	2.04
12860	1.93	0.50	0.30	10.49	0.047	2.36
8485	1.27	0.33	0.20	6.92	0.031	1.56
7690	1.15	0.30	0.18	6.28	0.028	1.41
8318	1.25	0.32	0.19	7.84	0.035	1.53
9176	1.38	0.35	0.21	7.49	0.034	1.68
9736	1.46	0.37	0.23	7.94	0.036	1.79
11677	1.75	0.45	0.27	8.47	0.038	2.14
11562	1.73	0.45	0.27	9.43	0.042	2.12
13880	2.08	0.53	0.32	11.33	0.051	2.55
8810	1.32	0.34	0.20	7.19	0.032	1.62
10157	1.52	0.39	0.24	8.29	0.037	1.86
14580	2.19	0.56	0.34	11.90	0.054	2.68
10266	1.54	0.40	0.24	8.38	0.038	1.88
8440	1.27	0.32	0.20	5.83	0.026	1.54
12905	1.94	0.50	0.30	10.53	0.047	2.37
7687	1.15	0.30	0.18	6.27	0.028	1.41
9585	1.44	0.37	0.22	7.82	0.035	1.76
11285	1.69	0.43	0.26	9.21	0.041	2.07
13001	1.95	0.50	0.30	10.61	0.048	2.39
10206	1.53	0.39	0.24	8.33	0.037	1.87
11302	1.70	0.44	0.26	9.22	0.042	2.08
7653	1.15	0.29	0.18	4.66	0.021	1.40
7725	1.16	0.30	0.18	6.30	0.028	1.42
11670	1.75	0.45	0.27	9.52	0.043	2.14
13166	1.97	0.51	0.31	10.74	0.048	2.42
11109	1.67	0.43	0.26	9.07	0.041	2.04
9250	1.39	0.36	0.21	7.55	0.034	1.70
13279	1.99	0.51	0.31	11.36	0.051	2.44
12996	1.95	0.50	0.30	12.72	0.057	2.40
475680	71.35	18.31	11.02	388.16	1.75	87.33
819840	122.98	30.65	19.00	669.00	3.01	150.52

Verified the population projection and sewage load calculation and found correct based on Sewerage Master Plan prepared for Kochi Corporation


Executive Engineer
Sewerage Circle
Kochi - 11




General Manager
(Design)
Kochi Metro Rail Limited
Kochi - 682017

EXPECTED SEWER LOAD CALCULATION FOR KOCHI CORPORATION																										
Return ratio					0.85																					
Infiltration of ground water					4500																					
Storm water flow					(accounted in return ratio)																					
Sewer load in year end					2020202120252035204020532055																					
Sewer load in Western Kochi					52.9653.2354.3057.0958.5560.2863.19																					
Sewer load in Mainland					73.2073.5775.0580.9280.9286.1887.33																					
Total					126.17126.80129.35138.01139.47146.46150.52																					
VENNALA ZONE																										
sewer load in year end					2020			2021			2025			2035			2040			2050			2055			
SL NO.	DIVISION	TOTAL	KMRL	KWA	NAME	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA
38 (75%)	75%	42%	33%		DEVANKULANGARA	1.29	0.72	0.57	1.30	0.73	0.57	1.32	0.74	0.58	1.39	0.78	0.61	1.43	0.80	0.63	1.52	0.85	0.67	1.54	0.86	0.68
40 (73%)	73%	40%	33%		MAMANGALAM	1.01	0.55	0.46	1.01	0.55	0.46	1.03	0.57	0.47	1.08	0.59	0.49	1.11	0.61	0.50	1.19	0.65	0.54	1.20	0.66	0.54
41 (100%)	100%	79%	21%		PADIVATTOM	1.45	1.14	0.30	1.46	1.15	0.31	1.49	1.17	0.31	1.56	1.23	0.33	1.60	1.27	0.34	1.71	1.35	0.36	1.73	1.37	0.36
42 (100%)	100%	95.5%	4.5%		VENNALA	1.92	1.84	0.09	1.93	1.84	0.09	1.97	1.88	0.09	2.07	1.98	0.09	2.12	2.03	0.10	2.26	2.16	0.10	2.29	2.19	0.10
46 (100%)	100%	43%	57%		CHAKKARAPARAMBU	1.98	0.85	1.13	1.99	0.86	1.13	2.03	0.87	1.16	2.13	0.92	1.22	2.19	0.94	1.25	2.33	1.00	1.33	2.36	1.02	1.35
47 (100%)	100%	61%	39%		CHALIKKAVATTOM	1.31	0.80	0.51	1.31	0.80	0.51	1.34	0.82	0.52	1.41	0.86	0.55	1.44	0.88	0.56	1.54	0.94	0.60	1.56	0.95	0.61
48 (75%)	75%		75%		PONNURUNNI EAST	0.89	0.00	0.89	0.89	0.00	0.89	0.91	0.00	0.91	0.96	0.00	0.96	0.98	0.00	0.98	1.04	0.00	1.04	1.06	0.00	1.06
TOTAL					9.84	5.90	3.94	9.89	5.93	3.96	10.09	6.05	4.04	10.61	6.36	4.24	10.88	6.52	4.35	11.58	6.95	4.64	11.74	7.04	4.70	
MUTTAR ZONE																										
sewer load in year end					2020			2021			2025			2035			2040			2050			2055			
SL NO.	DIVISION	TOTAL	KMRL	KWA	NAME	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA
33 (43%)	43%	43%			ELAMAKARA NORTH	0.73	0.73	0.00	0.74	0.74	0.00	0.75	0.75	0.00	0.79	0.79	0.00	0.81	0.81	0.00	0.86	0.86	0.00	0.87	0.87	0.00
34 (47%)	47%	47%			PUTHUKKALAVATTOM	0.85	0.85	0.00	0.85	0.85	0.00	0.87	0.87	0.00	0.91	0.91	0.00	0.93	0.93	0.00	1.00	1.00	0.00	1.01	1.01	0.00
35 (100%)	100%	100%			PONEKKARA	1.74	1.74	0.00	1.75	1.75	0.00	1.79	1.79	0.00	1.88	1.88	0.00	1.93	1.93	0.00	2.05	2.05	0.00	2.08	2.08	0.00
36 (100%)	100%	18%	82%		KUNNUPURAM	1.51	0.27	1.24	1.52	0.27	1.25	1.55	0.28	1.27	1.63	0.29	1.34	1.67	0.30	1.37	1.78	0.32	1.46	1.80	0.32	1.48
37 (100%)	100%	100%			EDAPPILLY	1.83	1.83	0.00	1.84	1.84	0.00	1.87	1.87	0.00	1.97	1.97	0.00	2.02	2.02	0.00	2.15	2.15	0.00	2.18	2.18	0.00
38 (25%)	25%	25%			DEVANKULANGARA	0.43	0.43	0.00	0.43	0.43	0.00	0.44	0.44	0.00	0.46	0.46	0.00	0.48	0.48	0.00	0.51	0.51	0.00	0.51	0.51	0.00
39 (59%)	59%	59%			KARUKAPPILLY	1.08	1.08	0.00	1.08	1.08	0.00	1.10	1.10	0.00	1.16	1.16	0.00	1.19	1.19	0.00	1.27	1.27	0.00	1.28	1.28	0.00
40 (27%)	27%	27%			MAMANGALAM	0.37	0.37	0.00	0.37	0.37	0.00	0.38	0.38	0.00	0.40	0.40	0.00	0.41	0.41	0.00	0.44	0.44	0.00	0.44	0.44	0.00
70 (25%)	25%	25%			KALOOR NORTH	0.51	0.51	0.00	0.51	0.51	0.00	0.52	0.52	0.00	0.55	0.55	0.00	0.56	0.56	0.00	0.60	0.60	0.00	0.60	0.60	0.00
71 (53%)	53%	53%			ELAMAKKARA SOUTH	0.91	0.91	0.00	0.91	0.91	0.00	0.93	0.93	0.00	0.98	0.98	0.00	1.00	1.00	0.00	1.07	1.07	0.00	1.08	1.08	0.00
72 (49%)	49%	49%			POTTAKKUZHY	0.70	0.70	0.00	0.70	0.70	0.00	0.72	0.72	0.00	0.75	0.75	0.00	0.77	0.77	0.00	0.82	0.82	0.00	0.83	0.83	0.00
TOTAL					10.65	9.41	1.24	10.70	9.46	1.25	10.92	9.65	1.27	11.48	10.14	1.34	11.77	10.40	1.37	12.54	11.08	1.46	12.71	11.23	1.48	
PERANDOOR ZONE																										
sewer load in year end					2020			2021			2025			2035			2040			2050			2055			
SL NO.	DIVISION	TOTAL	KMRL	KWA	NAME	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA
32 (28%)	28%	28%			VADUTHALA EAST	0.43	0.43	0.00	0.44	0.44	0.00	0.45	0.45	0.00	0.47	0.47	0.00	0.48	0.48	0.00	0.51	0.51	0.00	0.52	0.52	0.00
33 (57%)	57%	57%			ELAMAKARA NORTH	0.97	0.97	0.00	0.98	0.98	0.00	0.99	0.99	0.00	1.05	1.05	0.00	1.07	1.07	0.00	1.14	1.14	0.00	1.16	1.16	0.00
34 (53%)	53%	24%	29%		PUTHUKKALAVATTOM	0.95	0.43	0.52	0.96	0.43	0.52	0.98	0.44	0.53	1.03	0.47	0.56	1.05	0.48	0.58	1.12	0.51	0.61	1.14	0.52	0.62
65 (15%)	15%	15%			KALOOR SOUTH	0.24	0.24	0.00	0.24	0.24	0.00	0.24	0.24	0.00	0.25	0.25	0.00	0.26	0.26	0.00	0.28	0.28	0.00	0.28	0.28	0.00
69 (46%)	46%	46%			THRIKKANARVATTOM	0.83	0.83	0.00	0.83	0.83	0.00	0.85	0.85	0.00	0.89	0.89	0.00	0.91	0.91	0.00	0.97	0.97	0.00	0.99	0.99	0.00
70 (75%)	75%	75%			KALOOR NORTH	1.52	1.52	0.00	1.53	1.53	0.00	1.56	1.56	0.00	1.64	1.64	0.00	1.68	1.68	0.00	1.79	1.79	0.00	1.81	1.81	0.00
71 (47%)	47%	47%			ELAMAKKARA SOUTH	0.80	0.80	0.00	0.81	0.81	0.00	0.82	0.82	0.00	0.87	0.87	0.00	0.89	0.89	0.00	0.95	0.95	0.00	0.96	0.96	0.00
72 (51%)	51%	51%			POTTAKKUZHY	0.73	0.73	0.00	0.73	0.73	0.00	0.74	0.74	0.00	0.78	0.78	0.00	0.80	0.80	0.00	0.85	0.85	0.00	0.87	0.87	0.00
73 (88%)	88%	88%			PACHALAM	1.80	1.80	0.00	1.81	1.81	0.00	1.84	1.84	0.00	1.94	1.94	0.00	1.99	1.99	0.00	2.12	2.12	0.00	2.15	2.15	0.00
TOTAL					8.27	7.75	0.52	8.31	7.78	0.52	8.48	7.94	0.53	8.91	8.35	0.56	9.14	8.56	0.58	9.73	9.12	0.61	9.87	9.24	0.62	
VADUTHALA ZONE																										
sewer load in year end					2020			2021			2025			2035			2040			2050			2055			
SL NO.	DIVISION	TOTAL	KMRL	KWA	NAME	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA
31 (100%)	100%				VADUTHALA WEST	1.80		1.80	1.81		1.81	1.84		1.84	1.94		1.94	1.99		1.99	2.12		2.12	2.14		2.14
32 (72%)	72%				VADUTHALA EAST	1.12		1.12	1.12		1.15	1.15		1.20	1.24		1.24	1.32		1.32	1.33		1.33		1.33	
67 (40%)	40%				ERNAKULAM NORTH	0.47		0.47	0.47		0.48	0.48		0.50	0.52		0.52	0.55		0.55	0.56		0.56		0.56	
68 (100%)	100%				AYYAPPANKAV	1.19		1.19	1.19		1.22	1.22		1.28	1.31		1.31	1.40		1.40	1.42		1.42		1.42	
69 (54%)	54%				THRIKKANARVATTOM	0.97		0.97	0.97		0.99	0.99		1.05	1.07		1.07	1.14		1.14	1.16		1.16		1.16	
73 (12%)	12%				PACHALAM	0.25		0.25	0.25		0.25	0.25		0.26	0.27		0.27	0.29		0.29	0.29		0.29		0.29	
74 (100%)	100%				THATTAZHAM	2.00		2.00	2.01		2.05	2.05		2.17	2.22		2.22	2.36		2.36	2.40		2.40		2.40	
TOTAL					7.79		7.79	7.83		7.83	7.99		7.99	8.40		8.40	8.62		8.62	9.18		9.18	9.30		9.30	

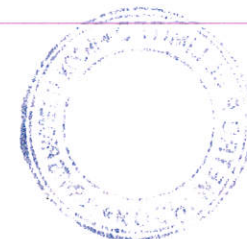
SEPTAGE ZONE																								
				sewer load in year end	2020			2021			2025			2035			2040			2050			2055	
SL NO.	DIVISION	TOTAL		KWA	NAME	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	TOTAL		KWA	
1	50 (100%)	100%			CHAMBAKARA	1.41		1.41	1.42		1.42	1.45		1.45	1.52		1.52	1.56		1.56	1.66		1.66	
2	51 (60%)	60%			POONITHURA	0.90		0.90	0.90		0.90	0.92		0.92	0.97		0.97	0.99		0.99	1.06		1.06	
					TOTAL	2.31		2.31	2.32		2.32	2.37		2.37	2.49		2.49	2.55		2.55	2.72		2.72	
ELAMKULAM ZONE																								
				sewer load in year end	2020			2021			2025			2035			2040			2050			2055	
		TOTAL	KMRL	KWA	NAME	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	TOTAL	KMRL	KWA	
SL NO.	DIVISION																							
1	39 (41%)	41%	41%		KARUKAPPILLY	0.75	0.75	0.00	0.75	0.75	0.00	0.77	0.77	0.00	0.81	0.81	0.00	0.83	0.83	0.00	0.88	0.88	0.00	
2	43 (100%)	100%		100%	PALARIVATTOM	1.93	0.00	1.93	1.94	0.00	1.94	1.98	0.00	1.98	2.08	0.00	2.08	2.14	0.00	2.14	2.28	0.00	2.31	
3	44 (100%)	100%	53%	47%	KARANAKKODAM	1.86	0.99	0.88	1.87	0.99	0.88	1.91	1.01	0.90	2.01	1.06	0.94	2.06	1.09	0.97	2.19	1.16	1.03	
4	45 (100%)	100%	24%	76%	THAMMANAM	1.71	0.41	1.30	1.72	0.41	1.31	1.75	0.42	1.33	1.84	0.44	1.40	1.89	0.45	1.44	2.01	0.48	1.53	
5	48 (25%)	25%		25%	PONNURUNNI EAST	0.30	0.00	0.30	0.30	0.00	0.30	0.30	0.00	0.30	0.32	0.00	0.32	0.33	0.00	0.33	0.35	0.00	0.35	
6	49 (100%)	100%		100%	VYTTILA	1.28	0.00	1.28	1.29	0.00	1.29	1.31	0.00	1.31	1.38	0.00	1.38	1.42	0.00	1.42	1.51	0.00	1.51	
7	51 (40%)	40%		40%	POONITHURA	0.60	0.00	0.60	0.60	0.00	0.60	0.61	0.00	0.61	0.65	0.00	0.65	0.66	0.00	0.66	0.71	0.00	0.71	
8	52 (100%)	100%	58%	42%	VYTTILA JANATHA	1.80	1.04	0.75	1.81	1.05	0.76	1.84	1.07	0.77	1.93	1.12	0.81	1.98	1.15	0.83	2.11	1.22	0.89	
9	53 (100%)	100%	55%	45%	PONNURUNNI	1.78	0.98	0.80	1.79	0.98	0.80	1.82	1.00	0.82	1.92	1.05	0.86	1.97	1.08	0.89	2.09	1.15	0.94	
10	54 (100%)	100%		100%	ELAMKULAM	2.14	0.00	2.14	2.15	0.00	2.15	2.19	0.00	2.19	2.30	0.00	2.30	2.36	0.00	2.36	2.51	0.00	2.51	
11	55 (100%)	100%	70%	30%	GIRINAGAR	1.36	0.95	0.41	1.36	0.95	0.41	1.39	0.97	0.42	1.46	1.02	0.44	1.50	1.05	0.45	1.60	1.12	0.48	
12	56 (100%)	100%	85%	15%	PANAMPILLY NAGAR	1.56	1.33	0.23	1.57	1.34	0.24	1.60	1.36	0.24	1.68	1.43	0.25	1.73	1.47	0.26	1.84	1.56	0.28	
13	57 (100%)	100%	26%	74%	KADAVANTHRA	2.24	0.58	1.66	2.25	0.59	1.67	2.30	0.60	1.70	2.42	0.63	1.79	2.48	0.64	1.84	2.64	0.69	1.95	
14	58 (100%)	100%		100%	KONTHURUTHY	1.58	0.00	1.58	1.59	0.00	1.59	1.62	0.00	1.62	1.70	0.00	1.70	1.75	0.00	1.75	1.86	0.00	1.86	
15	59 (100%)	100%		100%	THEVARA	1.30	0.00	1.30	1.31	0.00	1.31	1.33	0.00	1.33	1.40	0.00	1.40	1.43	0.00	1.43	1.52	0.00	1.52	
16	60 (100%)	100%	61%	39%	PERUMANOOR	1.99	1.21	0.77	2.00	1.22	0.78	2.04	1.24	0.79	2.14	1.31	0.83	2.20	1.34	0.86	2.34	1.43	0.91	
17	61 (100%)	100%		100%	RAVIPURAM	1.18	0.00	1.18	1.19	0.00	1.19	1.21	0.00	1.21	1.28	0.00	1.28	1.31	0.00	1.31	1.39	0.00	1.39	
18	62 (100%)	100%	18%	82%	ERNAKULAM SOUTH	1.48	0.27	1.21	1.48	0.27	1.22	1.51	0.27	1.24	1.59	0.29	1.30	1.63	0.29	1.34	1.74	0.31	1.42	
19	63 (100%)	100%	68%	32%	GANDHINAGAR	1.74	1.18	0.56	1.75	1.19	0.56	1.78	1.21	0.57	1.87	1.27	0.60	1.92	1.31	0.61	2.04	1.39	0.65	
20	64 (100%)	100%	100%		KATHRIKADAV	2.00	2.00	0.00	2.01	2.01	0.00	2.05	2.05	0.00	2.16	2.16	0.00	2.21	2.21	0.00	2.36	2.36	0.00	
21	65 (85%)	85%	85%		KALOOR SOUTH	1.34	1.34	0.00	1.34	1.34	0.00	1.37	1.37	0.00	1.44	1.44	0.00	1.48	1.48	0.00	1.57	1.57	0.00	
22	66 (100%)	100%	24%	76%	ERNAKULAM CENTRAL	1.74	0.42	1.32	1.75	0.42	1.33	1.78	0.43	1.36	1.87	0.45	1.42	1.92	0.46	1.46	2.05	0.49	1.56	
23	67 (60%)	60%		60%	ERNAKULAM NORTH	0.71	0.00	0.71	0.71	0.00	0.71	0.72	0.00	0.72	0.76	0.00	0.76	0.78	0.00	0.78	0.83	0.00	0.83	
					TOTAL	34.35	13.44	20.20	33.81	13.51	20.30	35.21	13.78	20.71	36.25	14.48	21.77	37.18	14.85	22.33	39.59	15.82	23.78	

TOTAL KMRL KWA
87.33 43.54 43.79
87.33

Verified the population projection and sewage load calculation and found correct based on Sewerage
Master Plan prepared for Kochi Corporation

Executive Engineer
Sewerage Circle
Kochi - 11





Anticipated population in 2035	Floating population in 2035	Floating demand in 2035	Anticipated population in 2040	Floating population in 2040	Floating demand in 2040	Anticipated population in 2050	Floating population in 2050	Floating demand in 2050	Anticipated population in 2055	Floating population in 2055	Floating demand in 2055
729197	401058	28.07	750872	412980	28.91	796175	437896	30.65	819841	450913	31.56
22428	6728	0.47	22428	6728	0.47	22428	6728	0.47	22428	6728	0.47
40776	6116	0.43	41676	6251	0.44	43534	6530	0.46	44494	6674	0.47
87593	17519	1.23	91500	18300	1.28	99846	19969	1.40	104300	20860	1.46
52995	10599	0.74	54907	10981	0.77	58940	11788	0.83	61067	12213	0.85
100261	20052	1.40	105838	21168	1.48	117939	23588	1.65	124500	24900	1.74
60632	12126	0.85	64757	12951	0.91	73871	14774	1.03	78897	15779	1.10
46571	4657	0.33	48978	4898	0.34	54170	5417	0.38	56970	5697	0.40
40758	6114	0.43	42659	6399	0.45	46732	7010	0.49	48912	7337	0.51
26241	2624	0.18	26704	2670	0.19	27656	2766	0.19	28144	2814	0.20
24919	2492	0.17	25168	2517	0.18	25673	2567	0.18	25929	2593	0.18
54435	5444	0.38	55244	5524	0.39	56898	5690	0.40	57744	5774	0.40
22168	2217	0.16	22238	2224	0.16	22380	2238	0.16	22451	2245	0.16
33445	5017	0.35	34406	5161	0.36	36411	5462	0.38	37457	5619	0.39
41555	4156	0.29	42477	4248	0.30	44384	4438	0.31	45369	4537	0.32
32357	6471	0.45	33285	6657	0.47	35223	7045	0.49	36233	7247	0.51
39279	5892	0.41	41378	6207	0.43	45918	6888	0.48	48372	7256	0.51
31739	3174	0.22	32890	3289	0.23	35319	3532	0.25	36600	3660	0.26
18041	1804	0.13	18428	1843	0.13	19227	1923	0.13	19639	1964	0.14
1505390	524260	36.70	1555833	540996	37.87	1662724	576248.4	40.34	1719347	594810.2	41.64
115224	23045	1.61	120606	24121	1.69	132135	26427	1.85	138307	27661	1.94



General Manager
(Design)
Kochi Metro Rail Limited
Kochi - 682017

Executive Engineer
Sewerage Circle
Kochi - 11

Local Body	Population as per 2011 Census data	% increase of population in last decade	Coefficient	Floating population in 2011	% increase of population in Ernakulam District in last decade	% increase of population adopted	Anticipated population in 2020	Floating population in 2020	Floating demand in 2020	Anticipated population in 2021	Floating population in 2021	Floating demand in 2021	Anticipated population in 2025	Floating population in 2025	Floating demand in 2025
Kochi [C]	633553	6.38	0.55	348454	5.69	6.03	667853	367319	25.71	671777	369477	25.86	687705	378238	26.48
Aluva [M]	22428	-6.98	0.3	6728	5.69	0.00	22428	6728	0.47	22428	6728	0.47	22428	6728	0.47
Eloor [M]	36722	3.23	0.15	5508	5.69	4.46	38193	5729	0.40	38360	5754	0.40	39035	5855	0.41
Kalamassery [M]	71038	12.55	0.2	14208	5.69	9.12	76844	15369	1.08	77517	15503	1.09	80271	16054	1.12
Maradu [M]	44704	9.00	0.2	8941	5.69	7.35	47649	9530	0.67	47988	9598	0.67	49368	9874	0.69
Thrikkakkara [M]	77319	17.18	0.2	15464	5.69	11.43	85232	17046	1.19	86160	17232	1.21	89973	17995	1.26
Edathala GP	44204	22.46	0.2	8841	5.69	14.07	49765	9953	0.70	50425	10085	0.71	53152	10630	0.74
Keezhmadu GP	36567	15.51	0.1	3657	5.69	10.60	40038	4004	0.28	40444	4044	0.28	42107	4211	0.29
Choornikkara GP	32746	13.41	0.15	4912	5.69	9.55	35547	5332	0.37	35873	5381	0.38	37205	5581	0.39
Nayarambalam GP	24127	1.43	0.1	2413	5.69	3.56	24899	2490	0.17	24986	2499	0.17	25339	2534	0.18
Njarackal GP	23760	-1.68	0.1	2376	5.69	2.00	24188	2419	0.17	24236	2424	0.17	24430	2443	0.17
Elamkunnappuzha GP	50714	0.30	0.1	5071	5.69	2.99	52079	5208	0.36	52233	5223	0.37	52853	5285	0.37
Mulavukad GP	21833	-4.42	0.1	2183	5.69	0.64	21958	2196	0.15	21972	2197	0.15	22028	2203	0.15
Kumbalam GP	29193	5.97	0.15	4379	5.69	5.83	30720	4608	0.32	30895	4634	0.32	31603	4740	0.33
Chellanam GP	37399	3.29	0.1	3740	5.69	4.49	38906	3891	0.27	39078	3908	0.27	39770	3977	0.28
Kumbalangy GP	28248	5.95	0.2	5650	5.69	5.82	29724	5945	0.42	29892	5978	0.42	30577	6115	0.43
Cheranalloor GP	30594	16.26	0.15	4589	5.69	10.97	33599	5040	0.35	33951	5093	0.36	35395	5309	0.37
Varappuzha GP	26750	9.08	0.1	2675	5.69	7.39	28522	2852	0.20	28725	2873	0.20	29556	2956	0.21
Kadamakkudy GP	16295	2.98	0.1	1630	5.69	4.33	16929	1693	0.12	17001	1700	0.12	17292	1729	0.12
1288194				451418			1365073	477351	33.41	1373941	480331	33.62	1410087	492458	34.47
Tripunithura	92550		0.2	18510	5.69	9.56	100476	20095	1.41	101398	20280	1.42	105169	21034	1.47



No.	Name of ward	Population as per 2011 Census	Road length in km	% increase of population adopted	Anticipated population in 2020	domestic demand in MLD @ 150 LPCD in 2020	Floating demand @ 70 LPCD in 2020	non-domestic demand in MLD in 2020	Road length in km	Infiltration in MLD in 2020	Total sewer load in MLD in 2020 with RR	Anticipated population in 2021	domestic demand in MLD @ 150 LPCD in 2021	Floating demand @ 70 LPCD in 2021	non-domestic demand in MLD in 2021	Road length in km	Infiltration in MLD in 2021
1	Marottichodu	2398	11.723	11.43	2643	0.40	0.037	0.07	11.72	0.053	0.48	2672	0.40	0.037	0.07	11.72	0.053
2	Bm nagar	1969	9.626	11.43	2170	0.33	0.030	0.06	9.63	0.043	0.39	2194	0.33	0.031	0.06	9.63	0.043
3	Thoppil	2285	11.171	11.43	2519	0.38	0.035	0.07	11.17	0.050	0.46	2546	0.38	0.036	0.07	11.17	0.050
4	Thrikkakara	2370	11.587	11.43	2612	0.39	0.037	0.07	11.59	0.052	0.47	2641	0.40	0.037	0.07	11.59	0.052
5	Kollamkudimugal	1805	8.824	11.43	1990	0.30	0.028	0.05	8.82	0.040	0.36	2011	0.30	0.028	0.05	8.82	0.040
6	Navodhaya	1570	7.675	11.43	1731	0.26	0.024	0.04	7.68	0.035	0.31	1749	0.26	0.024	0.04	7.68	0.035
7	Vallyattumugal	1302	6.365	11.43	1435	0.22	0.020	0.04	6.37	0.029	0.26	1451	0.22	0.020	0.04	6.37	0.029
8	Thengode	1953	9.548	11.43	2153	0.32	0.030	0.06	9.55	0.043	0.39	2176	0.33	0.030	0.06	9.55	0.043
9	Edachira	1712	8.370	11.43	1887	0.28	0.026	0.05	8.37	0.038	0.34	1908	0.29	0.027	0.05	8.37	0.038
10	Kalathikuzhy	2005	9.802	11.43	2210	0.33	0.031	0.06	9.80	0.044	0.40	2234	0.34	0.031	0.06	9.80	0.044
11	Nilampathinjimugal	2418	11.821	11.43	2665	0.40	0.037	0.07	11.82	0.053	0.48	2694	0.40	0.038	0.07	11.82	0.053
12	Kuzhikkattumoola	2470	12.075	11.43	2723	0.41	0.038	0.07	12.08	0.054	0.49	2752	0.41	0.039	0.07	12.08	0.054
13	Athani	2546	12.447	11.43	2806	0.42	0.039	0.07	12.45	0.056	0.51	2837	0.43	0.040	0.07	12.45	0.056
14	Mavelipuram	2442	11.939	11.43	2692	0.40	0.038	0.07	11.94	0.054	0.49	2721	0.41	0.038	0.07	11.94	0.054
15	Kakkanad health centre	2284	11.166	11.43	2518	0.38	0.035	0.06	11.17	0.050	0.46	2545	0.38	0.036	0.06	11.17	0.050
16	Kakkanad	1431	6.996	11.43	1577	0.24	0.022	0.04	7.00	0.031	0.29	1595	0.24	0.022	0.04	7.00	0.031
17	Chittethukara	1679	8.208	11.43	1851	0.28	0.026	0.05	8.21	0.037	0.34	1871	0.28	0.026	0.05	8.21	0.037
18	Kannankeri	1970	9.631	11.43	2172	0.33	0.030	0.06	9.63	0.043	0.39	2195	0.33	0.031	0.06	9.63	0.043
19	Thuthiyoor	2315	11.318	11.43	2552	0.38	0.036	0.07	11.32	0.051	0.46	2580	0.39	0.036	0.07	11.32	0.051
20	Kunnathuchira	2578	12.603	11.43	2842	0.43	0.040	0.07	12.60	0.057	0.52	2873	0.43	0.040	0.07	12.60	0.057
21	Palachuvadu	2660	13.004	11.43	2932	0.44	0.041	0.08	13.00	0.059	0.53	2964	0.44	0.041	0.08	13.00	0.059
22	Thanapadam	1483	7.250	11.43	1635	0.25	0.023	0.04	7.25	0.033	0.30	1653	0.25	0.023	0.04	7.25	0.033
23	Kambiveli	1353	6.615	11.43	1491	0.22	0.021	0.04	6.61	0.030	0.27	1508	0.23	0.021	0.04	6.61	0.030
24	T v centre	1626	7.949	11.43	1792	0.27	0.025	0.05	7.95	0.036	0.32	1812	0.27	0.025	0.05	7.95	0.036
25	Olikkuzhy	1478	7.226	11.43	1629	0.24	0.023	0.04	7.23	0.033	0.30	1647	0.25	0.023	0.04	7.23	0.033
26	Padamugal	1528	7.470	11.43	1684	0.25	0.024	0.04	7.47	0.034	0.31	1703	0.26	0.024	0.04	7.47	0.034
27	N g o quarters	1560	7.627	11.43	1720	0.26	0.024	0.04	7.63	0.034	0.31	1738	0.26	0.024	0.04	7.63	0.034
28	Kunneparambu	1463	7.152	11.43	1613	0.24	0.023	0.04	7.15	0.032	0.29	1630	0.24	0.023	0.04	7.15	0.032
29	Vazhakkala east	1488	7.275	11.43	1640	0.25	0.023	0.04	7.27	0.033	0.30	1658	0.25	0.023	0.04	7.27	0.033
30	Vazhakkala west	1463	7.152	11.43	1613	0.24	0.023	0.04	7.15	0.032	0.29	1630	0.24	0.023	0.04	7.15	0.032
31	Snehanilayam	1514	7.402	11.43	1669	0.25	0.023	0.04	7.40	0.033	0.30	1687	0.25	0.024	0.04	7.40	0.033
32	Kunneparambu west	1560	7.627	11.43	1720	0.26	0.024	0.04	7.63	0.034	0.31	1738	0.26	0.024	0.04	7.63	0.034
33	Cherumuttapuzhakkara	1490	7.284	11.43	1642	0.25	0.023	0.04	7.28	0.033	0.30	1660	0.25	0.023	0.04	7.28	0.033
34	Desiyakavala	1542	7.539	11.43	1700	0.26	0.024	0.04	7.54	0.034	0.31	1718	0.26	0.024	0.04	7.54	0.034
35	Housing board colony	2025	9.900	11.43	2232	0.33	0.031	0.06	9.90	0.045	0.40	2256	0.34	0.032	0.06	9.90	0.045
36	Kudilimukku	1349	6.595	11.43	1487	0.22	0.021	0.04	6.60	0.030	0.27	1503	0.23	0.021	0.04	6.60	0.030
37	Maleppally	1358	6.639	11.43	1497	0.22	0.021	0.04	6.64	0.030	0.27	1513	0.23	0.021	0.04	6.64	0.030
38	Krimakkadu	1454	7.108	11.43	1603	0.24	0.022	0.04	7.11	0.032	0.29	1620	0.24	0.023	0.04	7.11	0.032



39	Model engineering	1625	7.944	11.43	1791	0.27	0.025	0.05	7.94	0.036	0.32	1811	0.27	0.025	0.05	7.94	0.036
40	Sahakarana road	1537	7.514	11.43	1694	0.25	0.024	0.04	7.51	0.034	0.31	1713	0.26	0.024	0.04	7.51	0.034
41	Thoppil south	1473	7.201	11.43	1624	0.24	0.023	0.04	7.20	0.032	0.29	1641	0.25	0.023	0.04	7.20	0.032
42	Mambilliparambu	1432	7.001	11.43	1579	0.24	0.022	0.04	7.00	0.032	0.29	1596	0.24	0.022	0.04	7.00	0.032
43	Kennedi mukku	1356	6.629	11.43	1495	0.22	0.021	0.04	6.63	0.030	0.27	1511	0.23	0.021	0.04	6.63	0.030
IURWTS THRIKA		77319	378		85230	12.785	1.193	2.200	378	1.701	15.452	86155	12.923	1.206	2.200	378	1.701



sewer load in MLD in 2021 with RR	Anticipated population in 2025	domestic demand in MLD @ 150	Floating demand @ 70 LPCD in 2025	Total non-domestic demand in MLD in 2025	Road length in km	Infiltration in MLD in 2025	sewer load in MLD in 2025 with RR	Anticipated population in 2035	domestic demand in MLD @ 150 LPCD in 2035	Floating demand @ 70 LPCD in 2035	non-domestic demand in MLD in 2035	Road length in km	Infiltration in MLD in 2035	sewer load in MLD in 2035 with RR	Anticipated population in 2040	domestic demand in MLD @ 150 LPCD in 2040	Floating demand @ 70 LPCD in 2040	non-domestic demand in MLD in 2040	Road length in km
0.48	2790	0.42	0.039	0.07	11.72	0.053	0.50	3109	0.47	0.044	0.07	11.72	0.053	0.54	3282	0.49	0.046	0.07	11.72
0.40	2291	0.34	0.032	0.06	9.63	0.043	0.41	2553	0.38	0.036	0.06	9.63	0.043	0.45	2695	0.40	0.038	0.06	9.63
0.46	2659	0.40	0.037	0.07	11.17	0.050	0.48	2963	0.44	0.041	0.07	11.17	0.050	0.52	3127	0.47	0.044	0.07	11.17
0.48	2758	0.41	0.039	0.07	11.59	0.052	0.49	3073	0.46	0.043	0.07	11.59	0.052	0.54	3244	0.49	0.045	0.07	11.59
0.36	2100	0.32	0.029	0.05	8.82	0.040	0.38	2340	0.35	0.033	0.05	8.82	0.040	0.41	2470	0.37	0.035	0.05	8.82
0.32	1827	0.27	0.026	0.04	7.68	0.035	0.33	2036	0.31	0.029	0.04	7.68	0.035	0.36	2149	0.32	0.030	0.04	7.68
0.26	1515	0.23	0.021	0.04	6.37	0.029	0.27	1688	0.25	0.024	0.04	6.37	0.029	0.30	1782	0.27	0.025	0.04	6.37
0.39	2273	0.34	0.032	0.06	9.55	0.043	0.41	2532	0.38	0.035	0.06	9.55	0.043	0.44	2673	0.40	0.037	0.06	9.55
0.35	1992	0.30	0.028	0.05	8.37	0.038	0.36	2220	0.33	0.031	0.05	8.37	0.038	0.39	2343	0.35	0.033	0.05	8.37
0.40	2333	0.35	0.033	0.06	9.80	0.044	0.42	2600	0.39	0.036	0.06	9.80	0.044	0.46	2744	0.41	0.038	0.06	9.80
0.49	2814	0.42	0.039	0.07	11.82	0.053	0.50	3135	0.47	0.044	0.07	11.82	0.053	0.55	3310	0.50	0.046	0.07	11.82
0.50	2874	0.43	0.040	0.07	12.08	0.054	0.51	3203	0.48	0.045	0.07	12.08	0.054	0.56	3381	0.51	0.047	0.07	12.08
0.51	2963	0.44	0.041	0.07	12.45	0.056	0.53	3301	0.50	0.046	0.07	12.45	0.056	0.58	3485	0.52	0.049	0.07	12.45
0.49	2842	0.43	0.040	0.07	11.94	0.054	0.51	3166	0.47	0.044	0.07	11.94	0.054	0.55	3342	0.50	0.047	0.07	11.94
0.46	2658	0.40	0.037	0.06	11.17	0.050	0.48	2961	0.44	0.041	0.06	11.17	0.050	0.52	3126	0.47	0.044	0.06	11.17
0.29	1665	0.25	0.023	0.04	7.00	0.031	0.30	1855	0.28	0.026	0.04	7.00	0.031	0.32	1959	0.29	0.027	0.04	7.00
0.34	1954	0.29	0.027	0.05	8.21	0.037	0.35	2177	0.33	0.030	0.05	8.21	0.037	0.38	2298	0.34	0.032	0.05	8.21
0.40	2292	0.34	0.032	0.06	9.63	0.043	0.41	2554	0.38	0.036	0.06	9.63	0.043	0.45	2696	0.40	0.038	0.06	9.63
0.47	2694	0.40	0.038	0.07	11.32	0.051	0.48	3002	0.45	0.042	0.07	11.32	0.051	0.53	3169	0.48	0.044	0.07	11.32
0.52	3000	0.45	0.042	0.07	12.60	0.057	0.54	3343	0.50	0.047	0.07	12.60	0.057	0.59	3528	0.53	0.049	0.07	12.60
0.54	3095	0.46	0.043	0.08	13.00	0.059	0.55	3449	0.52	0.048	0.08	13.00	0.059	0.60	3641	0.55	0.051	0.08	13.00
0.30	1726	0.26	0.024	0.04	7.25	0.033	0.31	1923	0.29	0.027	0.04	7.25	0.033	0.34	2030	0.30	0.028	0.04	7.25
0.27	1574	0.24	0.022	0.04	6.61	0.030	0.28	1754	0.26	0.025	0.04	6.61	0.030	0.31	1852	0.28	0.026	0.04	6.61
0.33	1892	0.28	0.026	0.05	7.95	0.036	0.34	2108	0.32	0.030	0.05	7.95	0.036	0.37	2225	0.33	0.031	0.05	7.95
0.30	1720	0.26	0.024	0.04	7.23	0.033	0.31	1916	0.29	0.027	0.04	7.23	0.033	0.34	2023	0.30	0.028	0.04	7.23
0.31	1778	0.27	0.025	0.04	7.47	0.034	0.32	1981	0.30	0.028	0.04	7.47	0.034	0.35	2091	0.31	0.029	0.04	7.47
0.31	1815	0.27	0.025	0.04	7.63	0.034	0.33	2023	0.30	0.028	0.04	7.63	0.034	0.35	2135	0.32	0.030	0.04	7.63
0.29	1702	0.26	0.024	0.04	7.15	0.032	0.30	1897	0.28	0.027	0.04	7.15	0.032	0.33	2002	0.30	0.028	0.04	7.15
0.30	1731	0.26	0.024	0.04	7.27	0.033	0.31	1929	0.29	0.027	0.04	7.27	0.033	0.34	2037	0.31	0.029	0.04	7.27
0.29	1702	0.26	0.024	0.04	7.15	0.032	0.30	1897	0.28	0.027	0.04	7.15	0.032	0.33	2002	0.30	0.028	0.04	7.15
0.31	1762	0.26	0.025	0.04	7.40	0.033	0.32	1963	0.29	0.027	0.04	7.40	0.033	0.34	2072	0.31	0.029	0.04	7.40
0.31	1815	0.27	0.025	0.04	7.63	0.034	0.33	2023	0.30	0.028	0.04	7.63	0.034	0.35	2135	0.32	0.030	0.04	7.63
0.30	1734	0.26	0.024	0.04	7.28	0.033	0.31	1932	0.29	0.027	0.04	7.28	0.033	0.34	2039	0.31	0.029	0.04	7.28
0.31	1794	0.27	0.025	0.04	7.54	0.034	0.32	1999	0.30	0.028	0.04	7.54	0.034	0.35	2111	0.32	0.030	0.04	7.54
0.41	2356	0.35	0.033	0.06	9.90	0.045	0.42	2626	0.39	0.037	0.06	9.90	0.045	0.46	2772	0.42	0.039	0.06	9.90
0.27	1570	0.24	0.022	0.04	6.60	0.030	0.28	1749	0.26	0.024	0.04	6.60	0.030	0.31	1846	0.28	0.026	0.04	6.60
0.27	1580	0.24	0.022	0.04	6.64	0.030	0.28	1761	0.26	0.025	0.04	6.64	0.030	0.31	1859	0.28	0.026	0.04	6.64
0.29	1692	0.25	0.024	0.04	7.11	0.032	0.30	1885	0.28	0.026	0.04	7.11	0.032	0.33	1990	0.30	0.028	0.04	7.11



0.33	1891	0.28	0.026	0.05	7.94	0.036	0.34	2107	0.32	0.030	0.05	7.94	0.036	0.37	2224	0.33	0.031	0.05	7.94
0.31	1788	0.27	0.025	0.04	7.51	0.034	0.32	1993	0.30	0.028	0.04	7.51	0.034	0.35	2104	0.32	0.029	0.04	7.51
0.30	1714	0.26	0.024	0.04	7.20	0.032	0.31	1910	0.29	0.027	0.04	7.20	0.032	0.33	2016	0.30	0.028	0.04	7.20
0.29	1666	0.25	0.023	0.04	7.00	0.032	0.30	1857	0.28	0.026	0.04	7.00	0.032	0.33	1960	0.29	0.027	0.04	7.00
0.27	1578	0.24	0.022	0.04	6.63	0.030	0.28	1758	0.26	0.025	0.04	6.63	0.030	0.31	1856	0.28	0.026	0.04	6.63
15.581	89969	13.495	1.260	2.200	378	1.701	16.113	100251	15.038	1.404	2.200	378	1.701	17.546	105825	15.874	1.482	2.200	378




Infiltration in MLD in 2040	sewer load in MLD in 2040 with RR	Anticipated population in 2053	Anticipated population in 2050	domestic demand in MLD @ 150	ng demand @ 70 LPCD	non-domestic demand in	Road length in km	ratio in MLD in 2053	l sewer load in	Anticipated population in 2055	domestic demand in MLD @ 150	g demand @ 70 LPCD in 2055	Total non-domestic demand in MLD in 2055	Road length in km	Infiltration in MLD in 2055	sewer load in MLD in 2055 with RR
0.053	0.57	3778	3657	0.55	0.05	0.07	11.72	0.053	0.62	3861	0.58	0.05	0.07	11.72	0.053	0.65
0.043	0.47	3102	3003	0.45	0.04	0.06	9.63	0.043	0.51	3170	0.48	0.04	0.06	9.63	0.043	0.53
0.050	0.54	3600	3485	0.52	0.05	0.07	11.17	0.050	0.59	3679	0.55	0.05	0.07	11.17	0.050	0.62
0.052	0.56	3734	3615	0.54	0.05	0.07	11.59	0.052	0.61	3816	0.57	0.05	0.07	11.59	0.052	0.64
0.040	0.43	2844	2753	0.41	0.04	0.05	8.82	0.040	0.47	2906	0.44	0.04	0.05	8.82	0.040	0.49
0.035	0.37	2473	2394	0.36	0.03	0.04	7.68	0.035	0.41	2528	0.38	0.04	0.04	7.68	0.035	0.42
0.029	0.31	2051	1986	0.30	0.03	0.04	6.37	0.029	0.34	2096	0.31	0.03	0.04	6.37	0.029	0.35
0.043	0.46	3077	2979	0.45	0.04	0.06	9.55	0.043	0.51	3144	0.47	0.04	0.06	9.55	0.043	0.53
0.038	0.41	2697	2611	0.39	0.04	0.05	8.37	0.038	0.44	2756	0.41	0.04	0.05	8.37	0.038	0.46
0.044	0.48	3159	3058	0.46	0.04	0.06	9.80	0.044	0.52	3228	0.48	0.05	0.06	9.80	0.044	0.54
0.053	0.57	3809	3688	0.55	0.05	0.07	11.82	0.053	0.63	3893	0.58	0.05	0.07	11.82	0.053	0.65
0.054	0.59	3891	3767	0.57	0.05	0.07	12.08	0.054	0.64	3977	0.60	0.06	0.07	12.08	0.054	0.67
0.056	0.60	4011	3883	0.58	0.05	0.07	12.45	0.056	0.66	4099	0.61	0.06	0.07	12.45	0.056	0.69
0.054	0.58	3847	3724	0.56	0.05	0.07	11.94	0.054	0.63	3931	0.59	0.06	0.07	11.94	0.054	0.66
0.050	0.54	3598	3483	0.52	0.05	0.06	11.17	0.050	0.59	3677	0.55	0.05	0.06	11.17	0.050	0.62
0.031	0.34	2254	2182	0.33	0.03	0.04	7.00	0.031	0.37	2304	0.35	0.03	0.04	7.00	0.031	0.39
0.037	0.40	2645	2561	0.38	0.04	0.05	8.21	0.037	0.43	2703	0.41	0.04	0.05	8.21	0.037	0.45
0.043	0.47	3104	3005	0.45	0.04	0.06	9.63	0.043	0.51	3172	0.48	0.04	0.06	9.63	0.043	0.53
0.051	0.55	3647	3531	0.53	0.05	0.07	11.32	0.051	0.60	3727	0.56	0.05	0.07	11.32	0.051	0.63
0.057	0.61	4062	3932	0.59	0.06	0.07	12.60	0.057	0.67	4150	0.62	0.06	0.07	12.60	0.057	0.70
0.059	0.63	4191	4057	0.61	0.06	0.08	13.00	0.059	0.69	4282	0.64	0.06	0.08	13.00	0.059	0.72
0.033	0.35	2336	2262	0.34	0.03	0.04	7.25	0.033	0.38	2388	0.36	0.03	0.04	7.25	0.033	0.40
0.030	0.32	2132	2064	0.31	0.03	0.04	6.61	0.030	0.35	2178	0.33	0.03	0.04	6.61	0.030	0.37
0.036	0.39	2562	2480	0.37	0.03	0.05	7.95	0.036	0.42	2618	0.39	0.04	0.05	7.95	0.036	0.44
0.033	0.35	2329	2254	0.34	0.03	0.04	7.23	0.033	0.38	2379	0.36	0.03	0.04	7.23	0.033	0.40
0.034	0.36	2407	2330	0.35	0.03	0.04	7.47	0.034	0.40	2460	0.37	0.03	0.04	7.47	0.034	0.41
0.034	0.37	2458	2379	0.36	0.03	0.04	7.63	0.034	0.40	2512	0.38	0.04	0.04	7.63	0.034	0.42
0.032	0.35	2305	2231	0.33	0.03	0.04	7.15	0.032	0.38	2355	0.35	0.03	0.04	7.15	0.032	0.40
0.033	0.35	2344	2269	0.34	0.03	0.04	7.27	0.033	0.39	2396	0.36	0.03	0.04	7.27	0.033	0.40
0.032	0.35	2305	2231	0.33	0.03	0.04	7.15	0.032	0.38	2355	0.35	0.03	0.04	7.15	0.032	0.40
0.033	0.36	2385	2309	0.35	0.03	0.04	7.40	0.033	0.39	2437	0.37	0.03	0.04	7.40	0.033	0.41
0.034	0.37	2458	2379	0.36	0.03	0.04	7.63	0.034	0.40	2512	0.38	0.04	0.04	7.63	0.034	0.42
0.033	0.35	2347	2272	0.34	0.03	0.04	7.28	0.033	0.39	2399	0.36	0.03	0.04	7.28	0.033	0.40
0.034	0.37	2429	2352	0.35	0.03	0.04	7.54	0.034	0.40	2483	0.37	0.03	0.04	7.54	0.034	0.42
0.045	0.48	3190	3088	0.46	0.04	0.06	9.90	0.045	0.52	3260	0.49	0.05	0.06	9.90	0.045	0.55
0.030	0.32	2125	2057	0.31	0.03	0.04	6.60	0.030	0.35	2172	0.33	0.03	0.04	6.60	0.030	0.37
0.030	0.32	2139	2071	0.31	0.03	0.04	6.64	0.030	0.35	2186	0.33	0.03	0.04	6.64	0.030	0.37
0.032	0.34	2291	2218	0.33	0.03	0.04	7.11	0.032	0.38	2341	0.35	0.03	0.04	7.11	0.032	0.39



0.036	0.39	2560	2478	0.37	0.03	0.05	7.94	0.036	0.42	2616	0.39	0.04	0.05	7.94	0.036	0.44
0.034	0.36	2421	2344	0.35	0.03	0.04	7.51	0.034	0.40	2474	0.37	0.03	0.04	7.51	0.034	0.42
0.032	0.35	2321	2247	0.34	0.03	0.04	7.20	0.032	0.38	2371	0.36	0.03	0.04	7.20	0.032	0.40
0.032	0.34	2256	2184	0.33	0.03	0.04	7.00	0.032	0.37	2305	0.35	0.03	0.04	7.00	0.032	0.39
0.030	0.32	2136	2068	0.31	0.03	0.04	6.63	0.030	0.35	2183	0.33	0.03	0.04	6.63	0.030	0.37
1.701	18.323	121810	117921	17.688	1.651	2.200	378	2	20	124479	18.672	1.743	2.200	378.00	1.701	20.924

Verified the population projection and found correct



Executive Engineer
Sewerage Circle
Kochi - 11




General Manager
(Design)
Kochi Metro Rail Limited
Kochi - 682017

No.	Name of ward	Population as per 2011 Census	% increase of population adopted	Anticipated population in 2020	domestic demand in MLD @ 150 LPCD in 2020	Floating demand @ 70 LPCD in 2020	Total non-domestic demand in MLD in 2020	Road length in km	Infiltration in MLD in 2020	Total sewer load in MLD in 2020 with RR	Anticipated population in 2021	domestic demand in MLD @ 150 LPCD in 2021	Floating demand @ 70 LPCD in 2021	Total non-domestic demand in MLD in 2021	Road length in km	Infiltration in MLD in 2021	Total sewer load in MLD in 2021 with RR	Anticipated population in 2025	domestic demand in MLD @ 150 LPCD in 2025	Floating demand @ 70 LPCD in 2025	Total non-domestic demand in MLD in 2025	Road length in km	Infiltration in MLD in 2025	Total sewer load in MLD in 2025 with RR	Anticipated population in 2035	domestic demand in MLD @ 150 LPCD in 2035
1	GLASS COLONY	2101	9.12	2273	0.34	0.032	0.08	7.63	0.034	0.42	2293	0.34	0.032	0.08	7.63	0.034	0.42	2374	0.36	0.033	0.08	7.63	0.034	0.43	2591	0.39
2	SANTHIGIRI ANNEXE	1976	9.12	2137	0.32	0.030	0.07	7.18	0.032	0.39	2156	0.32	0.030	0.07	7.18	0.032	0.39	2233	0.33	0.031	0.07	7.18	0.032	0.40	2436	0.37
3	RAJAGIRI	1854	9.12	2006	0.30	0.028	0.07	6.73	0.030	0.37	2023	0.30	0.028	0.07	6.73	0.030	0.37	2095	0.31	0.029	0.07	6.73	0.030	0.38	2286	0.34
4	SUNDARAGIRI	1637	9.12	1771	0.27	0.025	0.06	5.95	0.027	0.32	1786	0.27	0.025	0.06	5.95	0.027	0.33	1850	0.28	0.026	0.06	5.95	0.027	0.33	2018	0.30
5	NORTHKALAMASSERY	1719	9.12	1859	0.28	0.026	0.06	6.24	0.028	0.34	1876	0.28	0.026	0.06	6.24	0.028	0.34	1942	0.29	0.027	0.06	6.24	0.028	0.35	2120	0.32
6	HMT JN	1766	9.12	1910	0.29	0.027	0.06	6.41	0.029	0.35	1927	0.29	0.027	0.06	6.41	0.029	0.35	1996	0.30	0.028	0.06	6.41	0.029	0.36	2178	0.33
7	SUBSTATION	2527	9.12	2734	0.41	0.038	0.09	9.18	0.041	0.50	2757	0.41	0.039	0.09	9.18	0.041	0.50	2855	0.43	0.040	0.09	9.18	0.041	0.52	3116	0.47
8	ROCKWELL	2325	9.12	2515	0.38	0.035	0.08	8.44	0.038	0.46	2537	0.38	0.036	0.08	8.44	0.038	0.46	2627	0.39	0.037	0.08	8.44	0.038	0.47	2867	0.43
9	VIDAKUZA	2000	9.12	2163	0.32	0.030	0.07	7.26	0.033	0.39	2182	0.33	0.031	0.07	7.26	0.033	0.40	2260	0.34	0.032	0.07	7.26	0.033	0.41	2466	0.37
10	PERINGAZHA	2330	9.12	2520	0.38	0.035	0.08	8.46	0.038	0.46	2542	0.38	0.036	0.08	8.46	0.038	0.46	2633	0.39	0.037	0.08	8.46	0.038	0.48	2873	0.43
11	PIPELINE	1803	9.12	1950	0.29	0.027	0.06	6.55	0.029	0.36	1967	0.30	0.028	0.06	6.55	0.029	0.36	2037	0.31	0.029	0.06	6.55	0.029	0.37	2223	0.33
12	HMT ESTATE	959	9.12	1037	0.16	0.015	0.03	3.48	0.016	0.19	1046	0.16	0.015	0.03	3.48	0.016	0.19	1084	0.16	0.015	0.03	3.48	0.016	0.20	1182	0.18
13	KURUPRA	2028	9.12	2194	0.33	0.031	0.07	7.37	0.033	0.40	2213	0.33	0.031	0.07	7.37	0.033	0.40	2292	0.34	0.032	0.07	7.37	0.033	0.41	2501	0.38
14	MEDICAL COLLEGE	1706	9.12	1845	0.28	0.026	0.06	6.20	0.028	0.34	1862	0.28	0.026	0.06	6.20	0.028	0.34	1928	0.29	0.027	0.06	6.20	0.028	0.35	2104	0.32
15	THEVAKKAL	2022	9.12	2187	0.33	0.031	0.07	7.34	0.033	0.40	2206	0.33	0.031	0.07	7.34	0.033	0.40	2285	0.34	0.032	0.07	7.34	0.033	0.41	2493	0.37
16	PARAKKATTUMALA	985	9.12	1065	0.16	0.015	0.04	3.58	0.016	0.19	1075	0.16	0.015	0.04	3.58	0.016	0.20	1113	0.17	0.016	0.04	3.58	0.016	0.20	1215	0.18
17	PULIAMPURAM.	1322	9.12	1430	0.21	0.020	0.05	4.80	0.022	0.26	1443	0.22	0.020	0.05	4.80	0.022	0.26	1494	0.22	0.021	0.05	4.80	0.022	0.27	1630	0.24
18	MINI TOWNHALL	2301	9.12	2489	0.37	0.035	0.08	8.36	0.038	0.45	2511	0.38	0.035	0.08	8.36	0.038	0.46	2600	0.39	0.036	0.08	8.36	0.038	0.47	2837	0.43
19	KANGARAPADY	946	9.12	1023	0.15	0.014	0.03	3.44	0.015	0.19	1032	0.15	0.014	0.03	3.44	0.015	0.19	1069	0.16	0.015	0.03	3.44	0.015	0.19	1166	0.17
20	VADACODE	1265	9.12	1368	0.21	0.019	0.05	4.59	0.021	0.25	1380	0.21	0.019	0.05	4.59	0.021	0.25	1429	0.21	0.020	0.05	4.59	0.021	0.26	1560	0.23
21	UNIVERSITY COLONY	1560	9.12	1687	0.25	0.024	0.06	5.67	0.025	0.31	1702	0.26	0.024	0.06	5.67	0.025	0.31	1763	0.26	0.025	0.06	5.67	0.025	0.32	1924	0.29
22	PUNNAKKAL	988	9.12	1069	0.16	0.015	0.04	3.59	0.016	0.20	1078	0.16	0.015	0.04	3.59	0.016	0.20	1116	0.17	0.016	0.04	3.59	0.016	0.20	1218	0.18
23	ST. JOSEPH	1546	9.12	1672	0.25	0.023	0.06	5.61	0.025	0.31	1687	0.25	0.024	0.06	5.61	0.025	0.31	1747	0.26	0.024	0.06	5.61	0.025	0.32	1906	0.29
24	TOWN HALL	1391	9.12	1505	0.23	0.021	0.05	5.05	0.023	0.27	1518	0.23	0.021	0.05	5.05	0.023	0.28	1572	0.24	0.022	0.05	5.05	0.023	0.28	1715	0.26
25	CHENGAMPUZHA NAGAR	1343	9.12	1345	0.20	0.019	0.04	4.51	0.020	0.25	1356	0.20	0.019	0.04	4.51	0.020	0.25	1405	0.21	0.020	0.04	4.51	0.020	0.25	1533	0.23
26	UNIVERSITY	1400	9.12	1514	0.23	0.021	0.05	5.08	0.023	0.28	1528	0.23	0.021	0.05	5.08	0.023	0.28	1582	0.24	0.022	0.05	5.08	0.023	0.29	1726	0.26
27	THRIKKAKARA AMBALAM	1985	9.12	2147	0.32	0.030	0.07	7.21	0.032	0.39	2166	0.32	0.030	0.07	7.21	0.032	0.39	2243	0.34	0.031	0.07	7.21	0.032	0.41	2448	0.37
28	KANNAMKULAM	1364	9.12	1475	0.22	0.021	0.05	4.95	0.022	0.27	1488	0.22	0.021	0.05	4.95	0.022	0.27	1541	0.23	0.022	0.05	4.95	0.022	0.28	1682	0.25
29	HILL VALLEY	1406	9.12	1521	0.23	0.021	0.05	5.11	0.023	0.28	1534	0.23	0.021	0.05	5.11	0.023	0.28	1589	0.24	0.022	0.05	5.11	0.023	0.29	1734	0.26
30	LIBRARY	1925	9.12	2082	0.31	0.029	0.07	6.99	0.031	0.38	2101	0.32	0.029	0.07	6.99	0.031	0.38	2175	0.33	0.030	0.07	6.99	0.031	0.39	2374	0.36
31	PUTHUPALLYPRAM	1663	9.12	1799	0.27	0.025	0.06	6.04	0.027	0.33	1815	0.27	0.025	0.06	6.04	0.027	0.33	1879	0.28	0.026	0.06	6.04	0.027	0.34	2051	0.31
32	UNICHIRA	1484	9.12	1605	0.24	0.022	0.05	5.39	0.024	0.29	1619	0.24	0.023	0.05	5.39	0.024	0.30	1677	0.25	0.023	0.05	5.39	0.024	0.30	1830	0.27
33	PARUTHELI	1926	9.12	2083	0.31	0.029	0.07	6.99	0.031	0.38	2102	0.32	0.029	0.07	6.99	0.031	0.38	2176	0.33	0.030	0.07	6.99	0.031	0.39	2375	0.36
34	TOLLGATE	2103	9.12	2275	0.34	0.032	0.08	7.64	0.034	0.42	2295	0.34	0.032	0.08	7.64	0.034	0.42	2376	0.36	0.033	0.08	7.64	0.034	0.43	2593	0.39
35	KOONAMTHAI	1495	9.12	1617	0.24	0.023	0.05	5.43	0.024	0.30	1631	0.24	0.023	0.05	5.43	0.024	0.30	1689	0.25	0.024	0.05	5.43	0.024	0.31	1843	0.28
36	MUSIUM	1515	9.12	1639	0.25	0.023	0.05	5.50	0.025	0.30	1653	0.25	0.023	0.05	5.50	0.025	0.30	1712	0.26	0.024	0.05	5.50	0.025	0.31	1868	0.28
37	MUNICIPAL	1822	9.12	1971	0.30	0.028	0.07	6.62	0.030	0.36	1988	0.30	0.028	0.07	6.62	0.030	0.36	2059	0.31	0.029	0.07	6.62	0.030	0.37	2247	0.34
38	K B PARK	1870	9.12	2023	0.30	0.028	0.07	6.79	0.031	0.37	2041	0.31	0.029	0.07	6.79	0.031	0.37	2113	0.32	0.030	0.07	6.79	0.031	0.38	2306	0.35
39	VATTEKUNNAM	1515	9.12	1639	0.25	0.023	0.05	5.50	0.025	0.30	1653	0.25	0.023	0.05	5.50	0.025	0.30	1712	0.26	0.024	0.05	5.50	0.025	0.31	1868	0.28
40	MUTTAR	1405	9.12	1520	0.23	0.021	0.05	5.10	0.023	0.28	1533	0.23	0.021	0.05	5.10	0.023	0.28	1588	0.24	0.022	0.05	5.10	0.023	0.29	1732	0.26
41	INDUSTRIAL ESTATE	2109	9.12	2281	0.34	0.032	0.08	7.66	0.034	0.42	2301	0.35	0.032	0.08	7.66	0.034	0.42	2383	0.36	0.033	0.08	7.66	0.034	0.43	2600	0.39
42	CHAKYADAM	1751	9.12	1894	0.28	0.027	0.06	6.36	0.029	0.35	1911	0.29	0.027	0.06	6.36	0.029	0.35	1979	0.30	0.028	0.06	6.36	0.029	0.36	2159	0.32
KALAMSSERY		71038		76839.00	11.53	1.08	2.54	258.00	1.16	14.03	77514.00	11.63	1.09	2.54	258.00	1.16	14.13	80272.00	12.04	1.12	2.54	258.00	1.16	14.51	87594.00	13.14

Verified the population projection and found correct


Executive Engineer
Sewerage Circle
Kochi - 11


General Manager
(Design)
Kochi Metro Rail Limited
Kochi - 682017



Floating demand @ 70 LPCD in 2035	Total non-domestic demand in MLD in 2035	Road length in km	Infiltration in MLD in 2035	Total sewer load in MLD in 2035 with RR	Anticipated population in 2040	domestic demand in MLD @ 150 LPCD in 2040	Floating demand @ 70 LPCD in 2040	Total non-domestic demand in MLD in 204	Road length in km	Infiltration in MLD in 2040	Total sewer load in MLD in 2040 with RR	Anticipated population in 2050	domestic demand in MLD @ 150 LPCD in 2050	Floating demand @ 70 LPCD in 2050	Total non-domestic demand in MLD in 2050	Road length in km	ation in MLD in 2053	Total sewer load in MLD in 2050 with RR	Anticipated population in 2055	domestic demand in MLD @ 150 LPCD in 2055	Floating demand @ 70 LPCD in 2050	Total non-domestic demand in MLD in 2055	Road length in km	ation in MLD in 2055	Total sewer load in MLD in 2055 with RR
0.036	0.08	7.63	0.034	0.46	2706	0.41	0.038	0.08	7.63	0.034	0.48	2953	0.44	0.04	0.08	7.63	0.034	0.51	3085	0.46	0.04	0.08	7.63	0.034	0.53
0.034	0.07	7.18	0.032	0.43	2545	0.38	0.036	0.07	7.18	0.032	0.45	2777	0.42	0.04	0.07	7.18	0.032	0.48	2901	0.44	0.04	0.07	7.18	0.032	0.50
0.032	0.07	6.73	0.030	0.41	2388	0.36	0.033	0.07	6.73	0.030	0.42	2606	0.39	0.04	0.07	6.73	0.030	0.45	2722	0.41	0.04	0.07	6.73	0.030	0.47
0.028	0.06	5.95	0.027	0.36	2108	0.32	0.030	0.06	5.95	0.027	0.37	2301	0.35	0.03	0.06	5.95	0.027	0.40	2403	0.36	0.03	0.06	5.95	0.027	0.41
0.030	0.06	6.24	0.028	0.38	2214	0.33	0.031	0.06	6.24	0.028	0.39	2416	0.36	0.03	0.06	6.24	0.028	0.42	2524	0.38	0.04	0.06	6.24	0.028	0.43
0.030	0.06	6.41	0.029	0.39	2275	0.34	0.032	0.06	6.41	0.029	0.40	2482	0.37	0.03	0.06	6.41	0.029	0.43	2593	0.39	0.04	0.06	6.41	0.029	0.44
0.044	0.09	9.18	0.041	0.55	3255	0.49	0.046	0.09	9.18	0.041	0.57	3552	0.53	0.05	0.09	9.18	0.041	0.61	3710	0.56	0.05	0.09	9.18	0.041	0.64
0.040	0.08	8.44	0.038	0.51	2995	0.45	0.042	0.08	8.44	0.038	0.53	3268	0.49	0.05	0.08	8.44	0.038	0.56	3414	0.51	0.05	0.08	8.44	0.038	0.58
0.035	0.07	7.26	0.033	0.44	2576	0.39	0.036	0.07	7.26	0.033	0.45	2811	0.42	0.04	0.07	7.26	0.033	0.49	2936	0.44	0.04	0.07	7.26	0.033	0.50
0.040	0.08	8.46	0.038	0.51	3001	0.45	0.042	0.08	8.46	0.038	0.53	3275	0.49	0.05	0.08	8.46	0.038	0.57	3421	0.51	0.05	0.08	8.46	0.038	0.59
0.031	0.06	6.55	0.029	0.39	2322	0.35	0.033	0.06	6.55	0.029	0.41	2534	0.38	0.04	0.06	6.55	0.029	0.44	2647	0.40	0.04	0.06	6.55	0.029	0.45
0.017	0.03	3.48	0.016	0.21	1235	0.19	0.017	0.03	3.48	0.016	0.22	1348	0.20	0.02	0.03	3.48	0.016	0.23	1408	0.21	0.02	0.03	3.48	0.016	0.24
0.035	0.07	7.37	0.033	0.44	2612	0.39	0.037	0.07	7.37	0.033	0.46	2850	0.43	0.04	0.07	7.37	0.033	0.49	2977	0.45	0.04	0.07	7.37	0.033	0.51
0.029	0.06	6.20	0.028	0.37	2197	0.33	0.031	0.06	6.20	0.028	0.39	2398	0.36	0.03	0.06	6.20	0.028	0.41	2505	0.38	0.04	0.06	6.20	0.028	0.43
0.035	0.07	7.34	0.033	0.44	2604	0.39	0.036	0.07	7.34	0.033	0.46	2842	0.43	0.04	0.07	7.34	0.033	0.49	2969	0.45	0.04	0.07	7.34	0.033	0.51
0.017	0.04	3.58	0.016	0.22	1269	0.19	0.018	0.04	3.58	0.016	0.22	1384	0.21	0.02	0.04	3.58	0.016	0.24	1446	0.22	0.02	0.04	3.58	0.016	0.25
0.023	0.05	4.80	0.022	0.29	1703	0.26	0.024	0.05	4.80	0.022	0.30	1858	0.28	0.03	0.05	4.80	0.022	0.32	1941	0.29	0.03	0.05	4.80	0.022	0.33
0.040	0.08	8.36	0.038	0.50	2964	0.44	0.041	0.08	8.36	0.038	0.52	3234	0.49	0.05	0.08	8.36	0.038	0.56	3378	0.51	0.05	0.08	8.36	0.038	0.58
0.016	0.03	3.44	0.015	0.21	1218	0.18	0.017	0.03	3.44	0.015	0.21	1330	0.20	0.02	0.03	3.44	0.015	0.23	1389	0.21	0.02	0.03	3.44	0.015	0.24
0.022	0.05	4.59	0.021	0.28	1629	0.24	0.023	0.05	4.59	0.021	0.29	1778	0.27	0.02	0.05	4.59	0.021	0.31	1857	0.28	0.03	0.05	4.59	0.021	0.32
0.027	0.06	5.67	0.025	0.34	2009	0.30	0.028	0.06	5.67	0.025	0.35	2193	0.33	0.03	0.06	5.67	0.025	0.38	2290	0.34	0.03	0.06	5.67	0.025	0.39
0.017	0.04	3.59	0.016	0.22	1273	0.19	0.018	0.04	3.59	0.016	0.22	1389	0.21	0.02	0.04	3.59	0.016	0.24	1451	0.22	0.02	0.04	3.59	0.016	0.25
0.027	0.06	5.61	0.025	0.34	1991	0.30	0.028	0.06	5.61	0.025	0.35	2173	0.33	0.03	0.06	5.61	0.025	0.38	2270	0.34	0.03	0.06	5.61	0.025	0.39
0.024	0.05	5.05	0.023	0.30	1792	0.27	0.025	0.05	5.05	0.023	0.31	1955	0.29	0.03	0.05	5.05	0.023	0.34	2042	0.31	0.03	0.05	5.05	0.023	0.35
0.021	0.04	4.51	0.020	0.27	1601	0.24	0.022	0.04	4.51	0.020	0.28	1747	0.26	0.02	0.04	4.51	0.020	0.30	1825	0.27	0.03	0.04	4.51	0.020	0.31
0.024	0.05	5.08	0.023	0.31	1803	0.27	0.025	0.05	5.08	0.023	0.32	1968	0.30	0.03	0.05	5.08	0.023	0.34	2055	0.31	0.03	0.05	5.08	0.023	0.35
0.034	0.07	7.21	0.032	0.43	2557	0.38	0.036	0.07	7.21	0.032	0.45	2790	0.42	0.04	0.07	7.21	0.032	0.48	2914	0.44	0.04	0.07	7.21	0.032	0.50
0.024	0.05	4.95	0.022	0.30	1757	0.26	0.025	0.05	4.95	0.022	0.31	1917	0.29	0.03	0.05	4.95	0.022	0.33	2003	0.30	0.03	0.05	4.95	0.022	0.34
0.033	0.07	6.99	0.031	0.42	2479	0.37	0.035	0.07	6.99	0.031	0.44	2706	0.41	0.04	0.07	6.99	0.031	0.47	2826	0.42	0.04	0.07	6.99	0.031	0.48
0.029	0.06	6.04	0.027	0.36	2142	0.32	0.030	0.06	6.04	0.027	0.38	2337	0.35	0.03	0.06	6.04	0.027	0.40	2442	0.37	0.03	0.06	6.04	0.027	0.42
0.026	0.05	5.39	0.024	0.32	1911	0.29	0.027	0.05	5.39	0.024	0.34	2086	0.31	0.03	0.05	5.39	0.024	0.36	2179	0.33	0.03	0.05	5.39	0.024	0.37
0.033	0.07	6.99	0.031	0.42	2481	0.37	0.035	0.07	6.99	0.031	0.44	2707	0.41	0.04	0.07	6.99	0.031	0.47	2828	0.42	0.04	0.07	6.99	0.031	0.48
0.036	0.08	7.64	0.034	0.46	2709	0.41	0.038	0.08	7.64	0.034	0.48	2956	0.44	0.04	0.08	7.64	0.034	0.51	3088	0.46	0.04	0.08	7.64	0.034	0.53
0.026	0.05	5.43	0.024	0.33	1926	0.29	0.027	0.05	5.43	0.024	0.34	2101	0.32	0.03	0.05	5.43	0.024	0.36	2195	0.33	0.03	0.05	5.43	0.024	0.38
0.026	0.05	5.50	0.025	0.33	1951	0.29	0.027	0.05	5.50	0.025	0.34	2129	0.32	0.03	0.05	5.50	0.025	0.37	2224	0.33	0.03	0.05	5.50	0.025	0.38
0.031	0.07	6.62	0.030	0.40	2347	0.35	0.033	0.07	6.62	0.030	0.41	2561	0.38	0.04	0.07	6.62	0.030	0.44	2675	0.40	0.04	0.07	6.62	0.030	0.46
0.032	0.07	6.79	0.031	0.41	2409	0.36	0.034	0.07	6.79	0.031	0.42	2628	0.39	0.04	0.07	6.79	0.031	0.45	2745	0.41	0.04	0.07	6.79	0.031	0.47
0.026	0.05	5.50	0.025	0.33	1951	0.29	0.027	0.05	5.50	0.025	0.34	2129	0.32	0.03	0.05	5.50	0.025	0.37	2224	0.33	0.03	0.05	5.50	0.025	0.38
0.024	0.05	5.10	0.023	0.31	1810	0.27	0.025	0.05	5.10	0.023	0.32	1975	0.30	0.03	0.05	5.10	0.023	0.34	2063	0.31	0.03	0.05	5.10	0.023	0.35
0.036	0.08	7.66	0.034	0.46	2716	0.41	0.038	0.08	7.66	0.034	0.48	2964	0.44	0.04	0.08	7.66	0.034	0.51	3096	0.46	0.04	0.08	7.66	0.034	0.53
0.030	0.06	6.36	0.029	0.38	2255	0.34	0.032	0.06	6.36	0.029	0.40	2461	0.37	0.03	0.06	6.36	0.029	0.42	2571	0.39	0.04	0.06	6.36	0.029	0.44
1.23	2.54	258.00	1.16	15.53	91497.00	13.72	1.28	2.54	258.00	1.16	16.07	99845	14.98	1.40	2.54	258.00	1.16	17.24	104296.00	15.64	1.46	2.54	258.00	1.16	17.86



Local Body	institutions				hospitals with beds exceeding 100		hospitals with beds not exceeding 100		hotels		hostels		nursing homes & medical quarters		boarding schools and colleges		restaurants		day schools and colleges		cinema halls	
	Non-domestic water demand in MLD in 2011	Non-domestic water demand in MLD in 2020	Non-domestic water demand in MLD in 2035	Non-domestic water demand in MLD in 2050																		
Kochi [C]	31.08	48.24	50.75	53.76	50	3.38	50	1.275	150	1.4	120	1.22	150	0.5063	125	5.06	200	1.05	150	3.38	25	0.13
Aluva [M]	0.98	2.41	2.41	2.41	4	0.27	3	0.0765	40	0.4	20	0.20	15	0.0506	20	0.81	25	0.131	15	0.34	5	0.03
Eloor [M]	1.30	1.50	1.51	1.51	1	0.05	3	0.051	5	0	10	0.10	15	0.0506	10	0.41	30	0.158	10	0.23	5	0.03
Kalamassery [M]	2.21	12.11	13.12	13.12	5	0.23	5	0.085	20	0.2	20	0.20	30	0.1013	20	0.81	45	0.236	15	0.34	5	0.03
Maradu [M]	8.26	12.16	12.16	12.16	3	0.14	2	0.034	10	0.1	10	0.10	20	0.0675	10	0.41	25	0.131	10	0.23	7	0.04
Thrikkakkara [M]	14.94	15.76	15.18	17.18	3	0.14	4	0.068	8	0.1	12	0.12	15	0.0506	20	0.81	35	0.184	20	0.45	5	0.03
Edathala GP	2.10	2.83	3.01	3.01	2	0.09	2	0.034	5	0	5	0.05	6	0.0203	7	0.28	20	0.105	15	0.34	5	0.03
Keezhmadu GP	0.26	1.54	1.54	1.54	2	0.09	2	0.034	3	0	10	0.10	10	0.0338	12	0.49	30	0.158	20	0.45	5	0.03
Choornikkara GP	0.29	0.92	0.92	0.92	1	0.05	2	0.034	3	0	4	0.04	8	0.027	5	0.2	20	0.105	15	0.34	2	0.01
Nayarambalam GP	0.64	0.80	0.80	0.80	0	0	2	0.034	4	0	2	0.02	6	0.0203	5	0.2	12	0.063	15	0.34	4	0.02
Njarackal GP	0.72	0.85	0.85	0.85	0	0	2	0.034	4	0	5	0.05	5	0.0169	5	0.2	15	0.079	15	0.34	2	0.01
Elamkunnappuzha GP	1.50	1.73	1.73	1.73	0	0	2	0.034	5	0	5	0.05	5	0.0169	6	0.24	20	0.105	12	0.27	2	0.01
Mulavukad GP	4.32	6.31	7.41	8.51	0	0	2	0.034	2	0	4	0.04	5	0.0169	8	0.32	15	0.079	8	0.18	8	0.04
Kumbalam GP	0.74	1.48	1.48	1.48	0	0	4	0.068	5	0	5	0.05	10	0.0338	15	0.61	20	0.105	20	0.45	3	0.02
Chellanam GP	1.04	1.20	1.20	1.20	0	0	2	0.034	5	0	5	0.05	10	0.0338	12	0.49	20	0.105	15	0.34	2	0.01
Kumbalangy GP	8.68	3.12	3.12	3.12	0	0	2	0.034	7	0.1	8	0.08	8	0.027	5	0.2	15	0.079	8	0.18	2	0.01
Cheranalloor GP	0.87	1.27	1.27	1.27	1	0.05	4	0.068	6	0.1	5	0.05	8	0.027	12	0.49	20	0.105	15	0.34	3	0.02
Varappuzha GP	0.37	1.37	1.37	1.37	1	0.05	2	0.034	6	0.1	8	0.08	8	0.027	15	0.61	20	0.105	12	0.27	6	0.03
Kadamakkudy GP	0.3	0.95	0.95	0.95	0	0	1	0.017	3	0	4	0.04	6	0.0203	8	0.32	30	0.158	12	0.27	3	0.02
Thripunithura	8.50	10.50	12.20	12.20	8	0.36	8	0.136	10	0.1	12	0.12	15	0.0506	15	0.61	35	0.184	15	0.34	3	0.02



offices	demand in MLD	factories	demand in MLD	bus stations	demand in MLD	TOTAL assessed other ND	other ND as per report	Floating demand in MLD in 2050
450	0.71	100	0.45	150	0.34	18.84	19.00	22.58
30	0.05	15	0.07	15	0.03	2.41	1.13	0.47
15	0.02	15	0.07	25	0.06	1.25	1.46	0.58
50	0.08	15	0.07	25	0.06	2.41	2.54	2.37
30	0.05	10	0.05	25	0.06	1.37	1.22	1.31
55	0.09	20	0.09	30	0.07	2.16	2.20	3.01
15	0.02	10	0.05	15	0.03	1.09	0.49	2.05
20	0.03	12	0.05	22	0.05	1.54	0.30	0.90
15	0.02	4	0.02	22	0.05	0.92	0.33	0.75
15	0.02	2	0.01	15	0.03	0.80	0.74	0.18
15	0.02	4	0.02	20	0.05	0.85	0.83	0.17
18	0.03	2	0.01	20	0.05	0.86	1.73	0.36
10	0.02	8	0.04	12	0.03	0.81	0.75	0.15
25	0.04	3	0.01	25	0.06	1.48	0.85	0.51
20	0.03	2	0.01	24	0.05	1.20	1.20	0.30
15	0.02	2	0.01	10	0.02	0.73	0.83	0.50
20	0.03	2	0.01	20	0.05	1.27	1.00	0.77
24	0.04	5	0.02	24	0.05	1.37	0.42	0.53
20	0.03	3	0.01	15	0.03	0.95	0.34	0.13
55	0.09	10	0.05	30	0.07	2.10	2.20	3.01




General Manager
 (Design)
 Kochi Metro Rail Limited
 Kochi - 682017


Executive Engineer
 Sewerage Circle
 Kochi - 11

ANNEXURE 2

WATER QUALITY TEST RESULTS

Consultant:



ANNEXURE 2 WATER QUALITY TEST RESULTS

Project:

IURWTS

Client:



Test Report No: TC540219000006123F

Date: 24.03.2020

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CUSTOMER DETAILS

Customer Name & Address	M/s Antea Group 1st Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS

Sample Code	19000006123	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Edappally Canal	Sampling Location	Near Proposed STP
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	6.84
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	2529
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	446
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	6.19
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.12
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	2574
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	14.6
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	41.8
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	238
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	1.83
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	481
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	31.0
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	3.50
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	40

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Microbiologist

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K.J. Tower, Pathalam, Udyogamandal P.O., Ernakulam-683 501, Tel. 0484-2546660, 93 87 27 24 02, 90 74 34 14 43

Web: www.sealabs.in, E-mail: seaalab@gmail.com

Lalju P. N.
Laboratory Head

Test Report No: TC540219000006123F

Date: 24.03.2020

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CUSTOMER DETAILS

Customer Name & Address	M/s Antea Group 1st Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS

Sample Code	19000006123	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Edappally Canal	Sampling Location	Near Proposed STP
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	6.84
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	2529
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	446
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	6.19
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.12
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	2574
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	14.6
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	41.8
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	238
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	1.83
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	481
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	31.0
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	3.50
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	40

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Microbiologist

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K.J. Tower, Pathalam, Udyogamandal P.O., Ernakulam-683 501, Tel. 0484-2546660, 93 87 27 24 02, 90 74 34 14 43

Web: www.sealabs.in, E-mail: seaalab@gmail.com

Laiju P. N.
Laboratory Head

Test Report No: TC540219000006124F	Date: 24.03.2020	Page 1 of 1
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CUSTOMER DETAILS

Customer Name & Address	M/s Antea Group 1st Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS

Sample Code	19000006124	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Edappally Canal	Sampling Location	Near Lulu Mall
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	6.56
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	400
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	63.4
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	12.4
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	<0.02
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	481
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	26.4
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	0.20
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	49.0
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	0.10
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	30.9
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	37.1
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	0.84
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	13

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Microbiologist

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Web: www.sealabs.in, E-mail: seaalab@gmail.com

Laiju P. N.
Laboratory Head

Test Report No: TC540219000006124F	Date: 24.03.2020	Page 1 of 1
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CUSTOMER DETAILS			
Customer Name & Address		M/s Antea Group	
		1st Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.	
Customer Reference		Test Request Form Dated 20.03.2020	
SAMPLE DETAILS			
Sample Code	19000006124	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Edappally Canal	Sampling Location	Near Lulu Mall
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	6.56
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	400
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	63.4
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	12.4
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	<0.02
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	481
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	26.4
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	0.20
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	49.0
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	0.10
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	30.9
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	37.1
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	0.84
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	13

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Web: www.sealabs.in E-mail: sealabs@gmail.com

Lalju P. N.
Laboratory Head

Test Report No: TC540219000006125F	Date: 24.03.2020	Page 1 of 1
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CUSTOMER DETAILS			
Customer Name & Address		M/s Antea Group	
		1st Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.	
Customer Reference		Test Request Form Dated 20.03.2020	
SAMPLE DETAILS			
Sample Code	19000006125	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Edappally Canal	Sampling Location	Near Railway
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	6.85
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	2581
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	345
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	4.49
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.09
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	2648
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	26
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	12.1
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	39.3
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	1.97
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	568
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	21.4
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	0.18
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	14

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Web: www.sealabs.in, E-mail: seaalab@gmail.com

Laiju P. N.
Laboratory Head

Test Report No: TC540219000006125F

Date: 24.03.2020

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CUSTOMER DETAILS

Customer Name & Address	M/s Antea Group 1st Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS

Sample Code	19000006125	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Edappally Canal	Sampling Location	Near Railway
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	6.85
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	2581
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	345
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	4.49
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.09
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	2648
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	26
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	12.1
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	39.3
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	1.97
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	568
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	21.4
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	0.18
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	14

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Microbiologist

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K.I. Tower, Pathalam, Udvogamandal P.O., Ernakulam-683 501 Tel: 0484-2546660 93 87 27 24 02 90 74 34 14 43

Lalju P. N.
Laboratory Head

Test Report No: TC540219000006126F	Date: 24.03.2020	Page 1 of 1
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CUSTOMER DETAILS			
Customer Name & Address		M/s Antea Group	
		1st Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.	
Customer Reference		Test Request Form Dated 20.03.2020	
SAMPLE DETAILS			
Sample Code	19000006126	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Chelavannoor Canal	Sampling Location	Near Amrita
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	7.75
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	8970
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	1535
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	14.4
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	<0.02
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	9038
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	34.0
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	24.2
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	157
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	8.31
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	2225
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	36.5
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	2.62
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	21

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Microbiologist

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Web: www.sealabs.in, E-mail: seaalab@gmail.com

Sanju P. N.
Laboratory Head

Test Report No: TC540219000006126F	Date: 24.03.2020	Page 1 of 1
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CUSTOMER DETAILS			
Customer Name & Address		M/s Antea Group	
		1st Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.	
Customer Reference		Test Request Form Dated 20.03.2020	
SAMPLE DETAILS			
Sample Code	19000006126	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Chelavannoor Canal	Sampling Location	Near Amrita
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	7.75
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	8970
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	1535
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	14.4
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	<0.02
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	9038
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	34.0
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	24.2
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	157
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	8.31
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	2225
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	36.5
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	2.62
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	21

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Web: www.sealabs.in, E-mail: seaalab@gmail.com

Laiju P. N.
Laboratory Head

Test Report No: TC540219000006127F	Date: 24.03.2020	Page 1 of 1
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CUSTOMER DETAILS

Customer Name & Address	M/s Antea Group 1st Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS

Sample Code	19000006127	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Chelavannoor Canal	Sampling Location	Behind KSEB
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	7.17
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	569
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	123
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	23.2
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	<0.02
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	659
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	39.2
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	< 0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	24.9
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	126
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	0.15
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	58.9
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	72.7
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	3.22
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	22

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Web: www.sealabs.in, E-mail: seaalab@gmail.com

Leiju P. N.
Laboratory Head

Test Report No: TC540219000006127F	Date: 24.03.2020	Page 1 of 1
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CUSTOMER DETAILS			
Customer Name & Address		M/s Antea Group	
		1st Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.	
Customer Reference		Test Request Form Dated 20.03.2020	
SAMPLE DETAILS			
Sample Code	19000006127	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Chelavannoor Canal	Sampling Location	Behind KSEB
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	7.17
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	569
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	123
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	23.2
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	<0.02
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	659
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	39.2
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	< 0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	24.9
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	126
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	0.15
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	58.9
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	72.7
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	3.22
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	22

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Test Report No: TC540219000006128F	Date: 24.03.2020	Page 1 of 1
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CUSTOMER DETAILS

Customer Name & Address	M/s Antea Group 1st Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS

Sample Code	19000006128	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Chelavannoor Canal	Sampling Location	Near Elamkulam
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	7.30
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	3107
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	495
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	13.1
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.05
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	3202
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	34.6
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	0.71
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	20.2
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	59.0
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	2.59
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	568
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	42.2
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	2.66
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	26

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Web: www.sealabs.in, E-mail: seaalab@gmail.com

Lajju P.N.
Laboratory Head

Test Report No: TC540219000006128F

Date: 24.03.2020

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CUSTOMER DETAILS

Customer Name & Address	M/s Antea Group 1st Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS

Sample Code	19000006128	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	Chelavannoor Canal	Sampling Location	Near Elamkulam
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	7.30
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	3107
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	495
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	13.1
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.05
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	3202
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	34.6
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	0.71
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	20.2
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	59.0
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	2.59
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	568
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	42.2
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	2.66
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	26

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Web: www.sealabs.in, E-mail: seaalab@gmail.com

Lajju P. N.
Laboratory Head

Test Report No: TC540219000006129F	Date: 24.03.2020	Page 1 of 1
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CUSTOMER DETAILS

Customer Name & Address	M/s Antea Group 1st Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS

Sample Code	19000006129	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	ThevaraPerandoor Canal	Sampling Location	Near JalVayuVihar
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	7.04
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	2698
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	446
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	8.05
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.08
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	2766
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	28.5
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	24.2
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	128
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	2.23
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	402
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	49.7
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	3.42
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	27

End of Report

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Test Report No: TC540219000006129F

Date: 24.03.2020

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CUSTOMER DETAILS

Customer Name & Address	M/s Antea Group 1st Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS

Sample Code	19000006129	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	ThevaraPerandoor Canal	Sampling Location	Near JalVayuVihar
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	7.04
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	2698
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	446
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	8.05
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.08
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	2766
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	28.5
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	<0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	24.2
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	128
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	2.23
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	402
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	49.7
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	3.42
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	27

End of Report

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Web: www.sealabs.in, E-mail: seaalab@gmail.com

Laiju P. N.
Laboratory Head

Test Report No: TC540219000006130F

Date: 24.03.2020

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CUSTOMER DETAILS

Customer Name & Address	M/s Antea Group 1st Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS

Sample Code	19000006130	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	ThevaraPerandoor Canal	Sampling Location	Near P&T Colony
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	6.84
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	6498
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	95.0
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	7.23
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.04
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	6549
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	42.0
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	1.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	24.5
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	108
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	0.61
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	33.9
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	43.7
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	2.98
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	33

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Microbiologist

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Web: www.sealabs.in, E-mail: sealab@gmail.com

Laiju P. N.
Laboratory Head

Test Report No: TC540219000006130F

Date: 24.03.2020

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CUSTOMER DETAILS

Customer Name & Address	M/s Antea Group 1st Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS

Sample Code	19000006130	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	ThevaraPerandoor Canal	Sampling Location	Near P&T Colony
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	6.84
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	6498
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	95.0
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	7.23
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.04
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	6549
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	42.0
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	1.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	24.5
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	108
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	0.61
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	33.9
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	43.7
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	2.98
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	33

End of Report

For and on behalf of
Standard^S Environmental & Analytical Laboratories

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Salini T. S.
Microbiologist

Authorized Signatory

Authorized Signatory

The results are related only to the samples submitted for analysis and this test report shall not be reproduced except in full, without the written approval of the laboratory.

Standard^S Environmental & Analytical Laboratories

Accreditation and Approval: NABL as per ISO 17025: 2017 & "A" Grade Laboratory of KSPCB

K.J. Tower, Pathalam, Udyogamandal P.O., Ernakulam-683 501, Tel. 0484-2546660, 93 87 27 24 02, 90 74 34 14 43

Web: www.sealabs.in, E-mail: seaalab@gmail.com

Laiju P. N.
Laboratory Head

Test Report No: TC540219000006131F	Date: 24.03.2020	Page 1 of 1
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CUSTOMER DETAILS	
Customer Name & Address	M/s Antea Group 1st Floor, Kudiyirikkal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS			
Sample Code	19000006131	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	ThevaraPerandoorCanal	Sampling Location	Near Mini India
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	8.13
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	12324
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	1931
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	13.1
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.06
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	12392
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	18.0
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	< 0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	92.1
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	315
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	11.3
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	2825
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	29.4
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	1.44
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	17

End of Report

Test Report No: TC540219000006131F

Date: 24.03.2020

Page 1 of 1

CUSTOMER DETAILS

Customer Name & Address	M/s Antea Group 1st Floor, Kudiyrickal Building, Palarivattom, Ernakulam District.
Customer Reference	Test Request Form Dated 20.03.2020

SAMPLE DETAILS

Sample Code	19000006131	Sample Received On	20.03.2020
Sample Name	Water	Sampling Procedure	SEAAL/ENL/GEN/SOP/01& SEAAL/MBL/SOP/06
Sample Description	ThevaraPerandoorCanal	Sampling Location	Near Mini India
Identification By Customer	---	Sample Condition	Good
Sampled On	20.03.2020	Test Started On	20.03.2020
Sampled By	Laboratory	Test Completed On	24.03.2020

SL NO	TEST PARAMETER	TEST METHOD	UNIT	RESULT
01	pH	IS 3025 Part 11: 1983 RA 2017	---	8.13
02	Total Dissolved Solids	IS 3025 Part 16: 1984 RA 2017	mg/L	12324
03	Total Hardness (as CaCO ₃)	IS 3025 Part 21: 2009 RA 2019	mg/L	1931
04	Nitrate (as NO ₃)	APHA 23 rd Edition 4500-NO ₃ B 2017	mg/L	13.1
05	Nitrite (as NO ₂)	IS 3025 Part 21: 2009 RA 2019	mg/L	0.06
06	Total Solids	IS 3025 Part 15: 1984 RA 2019	mg/L	12392
07	Total Suspended Solids	IS 3025 Part 17: 1984 RA 2019	mg/L	18.0
08	Dissolved Oxygen	IS 3025 Part 38: 1989 RA 2019	mg/L	< 0.20
09	Biochemical Oxygen Demand (3 days at 27 °C)	IS 3025 Part 44: 1993 RA 2019	mg/L	92.1
10	Chemical Oxygen Demand	IS 3025 Part 58: 2006 RA 2017	mg/L	315
11	Salinity	APHA 23 rd Edition 2520 B Edn 2017	mg/L	11.3
12	Sodium as Na	IS 3025 Part 45: 1993 RA 2019	mg/L	2825
13	Total Nitrogen	IS 3025 Part 34: 1988 RA 2019	mg/L	29.4
14	Phosphates	IS 3025 Part 31: 1988 RA 2019	mg/L	1.44
15	Total Coliform	IS 15185 : 2016	---	Present/100 ml
16	Faecal Coliform	IS 1622:1981 RA 2014	MPN/100ml	17

End of Report

For and on behalf of
Standard^S Environmental & Analytical Laboratories

Page 2-18

Salini T. S.
Microbiologist

Authorized Signatory

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Web: www.sealabs.in, E-mail: seaalab@gmail.com

ANNEXURE 3

GROUNDWATER STUDY

Consultant:



ANNEXURE 3 GROUNDWATER STUDY

Project:

IURWTS

Client:



ANNEXURE 3 - WATER LEVEL MONITORING REPORT (Source:Groundwater Dept. Ernakulam)

State : Kerala District: Ernakulam				State : Kerala District: Ernakulam				State : Kerala District: Ernakulam				State : Kerala District: Ernakulam			
Well No: TW 01 Well Type: Tube Well				Well No: E89 Well Type: Dug Well				Well No: GWE-07 Well Type: Dug Well				Well No :E85 Well Type: Dug Well			
Location: Ernakulam Revenue Tower Compound				Location :Edappally St. George church compound				Location: In the plot of Sri. Krishnan near Edakochi bus stand				Location: Luthiram centre compound, Ravipuram junction			
N9 58.448 E76 16.812				N10 01.427 E76 18.415				N9 54.861 E76 17.444				N9 57.456 E76 17.349			
Monitoring Date	Time (hh:mm)	Water level		Monitoring Date	Time (hh:mm)	Water level		Monitoring Date	Time (hh:mm)	Water level		Monitoring Date	Time (hh:mm)	Water level	
30-Jan-15	14:00	10.02	1.02	31-Jan-15	11:00	1.87		30-Jan-15	11:10	0.72		30-Jan-15	13:30	0.77	
23-Feb-15	16:00	9.9	0.9	23-Feb-15	11:10	1.6		20-Feb-15	10:45	0.83		23-Feb-15	15:30	0.9	
24-Mar-15	14:05	10.07	1.07	25-Mar-15	14:05	1.6		24-Mar-15	16:15	0.87		24-Mar-15	14:30	0.81	
25-Apr-15	13:10	9.92	0.92	25-Apr-15	14:20	1.7		23-Apr-15	15:40	0.67		23-Apr-15	14:00	0.28	
14-May-15	10:35	9.7	0.7	14-May-15	16:05	1.01		14-May-15	11:30	0.68		14-May-15	10:50	0.55	
22-Jun-15	10:30	9.55	0.55	29-Jun-15	14:00	0.7		22-Jun-15	14:50	0.22		22-Jun-15	11:50	0.1	
22-Jul-15	11:50	9.6	0.6	21-Jul-15	14:50	0.65		22-Jul-15	14:10	0.32		22-Jul-15	14:20	0.2	
19-Aug-15	12:20	9.54	0.54	22-Aug-15	14:40	0.73		22-Aug-15	11:10	0.54		22-Aug-15	14:05	0.4	
17-Sep-15	13:45	9.62	0.62	17-Sep-15	11:15	0.59		22-Sep-15	12:07	0.52		17-Sep-15	13:55	-0.03	
27-Oct-15	14:30	9.6	0.6	27-Oct-15	10:55	1.05		29-Oct-15	12:30	0.47		27-Oct-15	14:35	0.47	
30-Nov-15	14:15	9.62	0.62	30-Nov-15	11:10	1.09		26-Nov-15	14:00	0.42		30-Nov-15	14:45	0.49	
14-Dec-15	15:30	9.7	0.7	28-Dec-15	13:45	0.89		28-Dec-15	11:15	0.77		28-Dec-15	13:15	0.57	
23-Jan-16	11:30	10.19	1.19	25-Jan-16	10:50	1.15		23-Jan-16	12:35	0.77		23-Jan-16	11:55	0.76	
25-Feb-16	13:50	10.05	1.05	25-Feb-16	11:15	1.46		15-Feb-16	11:50	0.73		15-Feb-16	13:10	0.49	
30-Mar-16	14:05	10.85	1.85	30-Mar-16	11:02	1.37		17-Mar-16	12:35	0.88		17-Mar-16	14:45	0.69	
19-Apr-16	14:00	12.95	3.95	29-Apr-16	10:15	1.42		19-Apr-16	11:00	0.87		19-Apr-16	13:15	0.64	
23-May-16	11:40	11.02	2.02	30-May-16	09:50	0.68		23-May-16	13:49	0.51		23-May-16	12:10	0.46	
08-Jun-16	13:10	10.22	1.22	30-Jun-16	10:26	0.65		08-Jun-16	10:45	0.17		08-Jun-16	12:10	-0.05	
12-Jul-16	12:15	10.05	1.05	13-Jul-16	10:55	0.59		12-Jul-16	10:10	0		12-Jul-16	11:45	-0.08	
19-Aug-16	14:10	9.6	0.6	12-Aug-16	10:30	0.79		19-Aug-16	10:55	0.69		19-Aug-16	13:40	0.47	
29-Sep-16	15:00	11.22	2.22	19-Sep-16	11:20	1.03		20-Sep-16	10:40	0.84		20-Sep-16	12:20	0.54	
14-Oct-16	13:30	10.9	1.9	18-Oct-16	10:40	1.04		14-Oct-16	11:10	0.72		14-Oct-16	12:55	0.04	
02-Nov-16	11:30	11.24	2.24	02-Nov-16	14:00	0.95		16-Nov-16	12:20	0.5		16-Nov-16	11:50	0.42	
17-Dec-16	15:10	11.6	2.6	17-Dec-16	10:45	1.15		13-Dec-16	11:25	0.79		13-Dec-16	13:05	0.64	
09-Jan-17	14:05	9.92	0.92	09-Jan-17	11:00	1.34		11-Jan-17	15:08	0.9		11-Jan-17	11:20	0.73	
09-Feb-17	12:00	11.98	2.98	13-Feb-17	11:45	1.5		09-Feb-17	15:25	0.8		09-Feb-17	12:28	0.81	
09-Mar-17	13:30	12.2	3.2	09-Mar-17	10:50	1.21		08-Mar-17	13:01	0.78		09-Mar-17	11:05	0.93	
12-Apr-17	11:58	12.45	3.45	07-Apr-17	11:10	1.52		12-Apr-17	15:45	0.89		12-Apr-17	12:30	0.95	
16-May-17	12:43	11.73	2.73	04-May-17	10:25	1.5		02-May-17	11:35	1.05		02-May-17	13:40	0.87	
03-Jun-17	14:00	11.13	2.13	03-Jun-17	11:05	0.67		14-Jun-17	10:30	0.31		14-Jun-17	13:45	0.14	
05-Jul-17	15:11	10.4	1.4	05-Jul-17	11:20	0.7		07-Jul-17	11:00	0.22		07-Jul-17	14:30	0.23	
01-Aug-17	15:00	10.37	1.37	01-Aug-17	10:30	0.78		08-Aug-17	10:55	0.32		08-Aug-17	13:20	0.05	
07-Sep-17	13:10	10.55	1.55	18-Sep-17	13:00	0.55		22-Sep-17	14:45	0.4		22-Sep-17	16:00	0.21	
11-Oct-17	13:12	10.39	1.39	13-Oct-17	10:13	1.12		11-Oct-17	11:18	0.47		11-Oct-17	12:57	0.31	
04-Nov-17	14:30	10.65	1.65	04-Nov-17	10:23	0.94		16-Nov-17	14:00	0.6		16-Nov-17	12:12	0.62	
11-Dec-17	11:00	10.74	1.74	11-Dec-17	15:30	2.03		01-Dec-17	11:13	0.62		01-Dec-17	12:46	0.53	
05-Jan-18	14:35	11	2	05-Jan-18	10:55	1.19		17-Jan-18	13:15	1.34		17-Jan-18	16:32	0.75	
06-Feb-18	12:45	10.8	1.8	06-Feb-18	10:00	1.33		05-Feb-18	14:15	0.75		05-Feb-18	16:10	0.81	
09-Mar-18	11:05	10.94	1.94	03-Mar-18	10:30	1.22		02-Mar-18	14:30	0.79		09-Mar-18	11:45	0.81	
03-Apr-18	15:50	10.88	1.88	03-Apr-18	10:30	1.6		10-Apr-18	14:40	0.94		10-Apr-18	13:23	0.94	
04-May-18	11:00	8.92	-0.08	05-May-18	20:05	1.64		04-May-18	11:50	0.54		04-May-18	11:30	0.47	
08-Jun-18	11:00	10.52	1.52	13-Jun-18	10:20	0.5		08-Jun-18	11:41	0.14		08-Jun-18	11:10	0.04	
11-Jul-18	11:10	10.35	1.35	11-Jul-18	10:45	0.72		11-Jul-18	13:20	0		11-Jul-18	11:35	-0.03	
04-Aug-18	12:15	10.66	1.66	04-Aug-18	11:20	0.63		04-Aug-18	15:15	0.25		04-Aug-18	12:39	0.37	
06-Sep-18	14:30	10.66	1.66	30-Aug-18	10:30	1		06-Sep-18	11:00	0.71		06-Sep-18	14:10	0.55	
29-Sep-18	14:20			24-Sep-18	10:30	1.27		29-Sep-18	12:00	0.84		29-Sep-18	14:00	0.42	
11-Oct-18	15:00	10.45	1.45	04-Oct-18	15:30	0.75		11-Oct-18	10:30	0.33		11-Oct-18	14:30	0.33	
07-Nov-18	12:00	10.53	1.53	13-Nov-18	10:30	0.91		07-Nov-18	14:45	0.58		07-Nov-18	12:40	0.42	
01-Dec-18	12:15	10.59	1.59	03-Dec-18	10:15	1.18		01-Dec-18	10:05	1.07		01-Dec-18	11:40	0.51	

Average season			Difference water level and groundwater level	
E85	E89		E85	E89
0.69	1.693	Dec-Apr	0.19	0.59
0.69	1.693		0.19	0.59
0.69	1.693		0.19	0.59
0.69	1.693		0.19	0.59
0.311	0.831	May-Nov	-0.19	-0.27
0.311	0.831		-0.19	-0.27
0.311	0.831		-0.19	-0.27
0.311	0.831		-0.19	-0.27
0.311	0.831		-0.19	-0.27
0.311	0.831		-0.19	-0.27
0.311	0.831		-0.19	-0.27
0.311	0.831		-0.19	-0.27
0.630	1.258	Dec-Apr	0.13	0.16
0.630	1.258		0.13	0.16
0.630	1.258		0.13	0.16
0.630	1.258		0.13	0.16
0.630	1.258		0.13	0.16
0.257	0.819	May-Nov	-0.24	-0.28
0.257	0.819		-0.24	-0.28
0.257	0.819		-0.24	-0.28
0.257	0.819		-0.24	-0.28
0.257	0.819		-0.24	-0.28
0.257	0.819		-0.24	-0.28
0.257	0.819		-0.24	-0.28
0.812	1.344	Dec-Apr	0.31	0.24
0.812	1.344		0.31	0.24
0.812	1.344		0.31	0.24
0.812	1.344		0.31	0.24
0.347	0.894	May-Nov	-0.15	-0.21
0.347	0.894		-0.15	-0.21
0.347	0.894		-0.15	-0.21
0.347	0.894		-0.15	-0.21
0.347	0.894		-0.15	-0.21
0.347	0.894		-0.15	-0.21
0.347	0.894		-0.15	-0.21
0.768	1.474	Dec-Apr	0.27	0.37
0.768	1.474		0.27	0.37
0.768	1.474		0.27	0.37
0.768	1.474		0.27	0.37
0.321	0.928	May-Nov	-0.18	-0.17
0.321	0.928		-0.18	-0.17
0.321	0.928		-0.18	-0.17
0.321	0.928		-0.18	-0.17
0.321	0.928		-0.18	-0.17
0.321	0.928		-0.18	-0.17
0.321	0.928		-0.18	-0.17
0.738	1.536	Dec-Apr	0.24	0.44

Well No.			
average	E85	TW01	E89
	0.48	1.59	1.12
stdev	0.29	0.77	0.41
min	-0.08	-0.08	0.50
max	0.95	3.95	2.08

	E85	difference water level (0.5 m bgl) *	
Dec-Apr	0.73	0.23	151 dgn
May-Nov	0.32	-0.18	214 dgn

	E89	difference water level (1.1 m bgl) *	
Dec-Apr	1.46	0.36	151 dgn
May-Nov	0.92	-0.18	214 dgn

* positive = infiltration from canal to groundwater
negative = drainage from groundwater to canal

surface water (m bgl)		
	Edappally	other canals
30-Jan-15	1.1	0.5
04-Dec-19	1.1	0.5

ANNEXURE 3 - WATER LEVEL MONITORING REPORT (Source:Groundwater Dept. Ernakulam)

State : Kerala District: Ernakulam				State : Kerala District: Ernakulam			State : Kerala District: Ernakulam			State : Kerala District: Ernakulam		
Well No: TW 01 Well Type: Tube Well				Well No: E89 Well Type: Dug Well			Well No: GWE-07 Well Type: Dug Well			Well No :E85 Well Type: Dug Well		
Location: Ernakulam Revenue Tower Compound				Location :Edappally St. George church compound			Location: In the plot of Sri. Krishnan near Edakochi bus stand			Location: Luthiram centre compound, Ravipuram junction		
N9 58.448 E76 16.812				N10 01.427 E76 18.415			N9 54.861 E76 17.444			N9 57.456 E76 17.349		
Monitoring Date	Time (hh:mm)	Water level		Monitoring Date	Time (hh:mm)	Water level	Monitoring Date	Time (hh:mm)	Water level	Monitoring Date	Time (hh:mm)	Water level
10-Jan-19	14:50	10.85	1.85	07-Jan-19	10:30	1.23	10-Jan-19	11:00	0.73	10-Jan-19	14:30	0.75
04-Feb-19	14:30	11.08	2.08	01-Feb-19	10:30	1.54	04-Feb-19	12:00	0.95	04-Feb-19	14:15	0.8
15-Mar-19	13:50	11.29	2.29	13-Mar-19	10:10	1.65	15-Mar-19	10:30	0.79	15-Mar-19	13:30	0.85
09-Apr-19	14:00	10.48	1.48	05-Apr-19	10:20	2.08	09-Apr-19	10:50	0.89	09-Apr-19	13:30	0.78
07-May-19	14:50	11.24	2.24	03-May-19	15:30	1.53	04-May-19	10:30	0.62	04-May-19	13:40	0.65
10-Jun-19	14:10	11.15	2.15	11-Jun-19	10:30	1.54	10-Jun-19	11:00	0.6	10-Jun-19	13:00	-0.01
03-Jul-19	13:40	11.3	2.3	05-Jul-19	10:30	0.87	03-Jul-19	10:30	0.58	31-Jul-19	13:10	0.52
03-Aug-19	10:30	10.99	1.99	08-Aug-19	15:30	0.7	03-Aug-19	13:45	0.58	03-Aug-19	11:00	0.49
05-Sep-19	13:05	10.38	1.38	05-Sep-19	09:10	0.68	05-Sep-19	11:40	0.32	05-Sep-19	11:10	0.33
10-Oct-19	13:40	10.62	1.62	01-Oct-19	10:30	0.61	10-Oct-19	11:00	0.37	10-Oct-19	13:00	0.41
04-Nov-19	14:40	10.07	1.07	05-Nov-19	10:30	1.84	04-Nov-19	11:20	0.2	04-Nov-19	13:20	0.23
04-Dec-19	12:45	10.54	1.54	02-Dec-19	09:50	0.78	04-Dec-19	10:40	0.61	04-Dec-19	12:30	0.46
average		10.59				1.12			0.61			0.48
stddev		0.77				0.41			0.27			0.29
min		8.92				0.50			0.00			-0.08
max		12.95				2.08			1.34			0.95



Average season			Difference water level and groundwater level	
E85	E89		E85	E89
0.738	1.536		0.24	0.44
0.738	1.536		0.24	0.44
0.738	1.536		0.24	0.44
0.738	1.536		0.24	0.44
0.374	1.110	May-Nov	-0.13	0.01
0.374	1.110		-0.13	0.01
0.374	1.110		-0.13	0.01
0.374	1.110		-0.13	0.01
0.374	1.110		-0.13	0.01
0.374	1.110		-0.13	0.01
0.374	1.110		-0.13	0.01
0.374	1.110		-0.13	0.01

Annexure 3 - Groundwater Ernakulam - Wells

Well No	Location	N	E	Water level
E85	Lutheran centre compound, Ravipuram junction	9.9617	76.2883	0.48
GWE-07	Sri. Krishnan near Edakochi bus stand	9.8958	76.2958	0.61
TW-01	Ernakulam Revenue Tower Compound	9.9747	76.2797	10.59
E89	Edappally St. George church compound	10.0219	76.3072	1.12

ANNEXURE 4

EXTRACT FROM GEOTECHNICAL REPORT BY FUGRO

Consultant: 	ANNEXURE 4 GEOTECHNICAL REPORT	Project: IURWTS	Client: 
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FUGRO INDIA

Detailed Factual Report Geotechnical Investigation For Integrated Urban Regeneration and Water Transport Project (IURWTS), Kochi Kerala, India

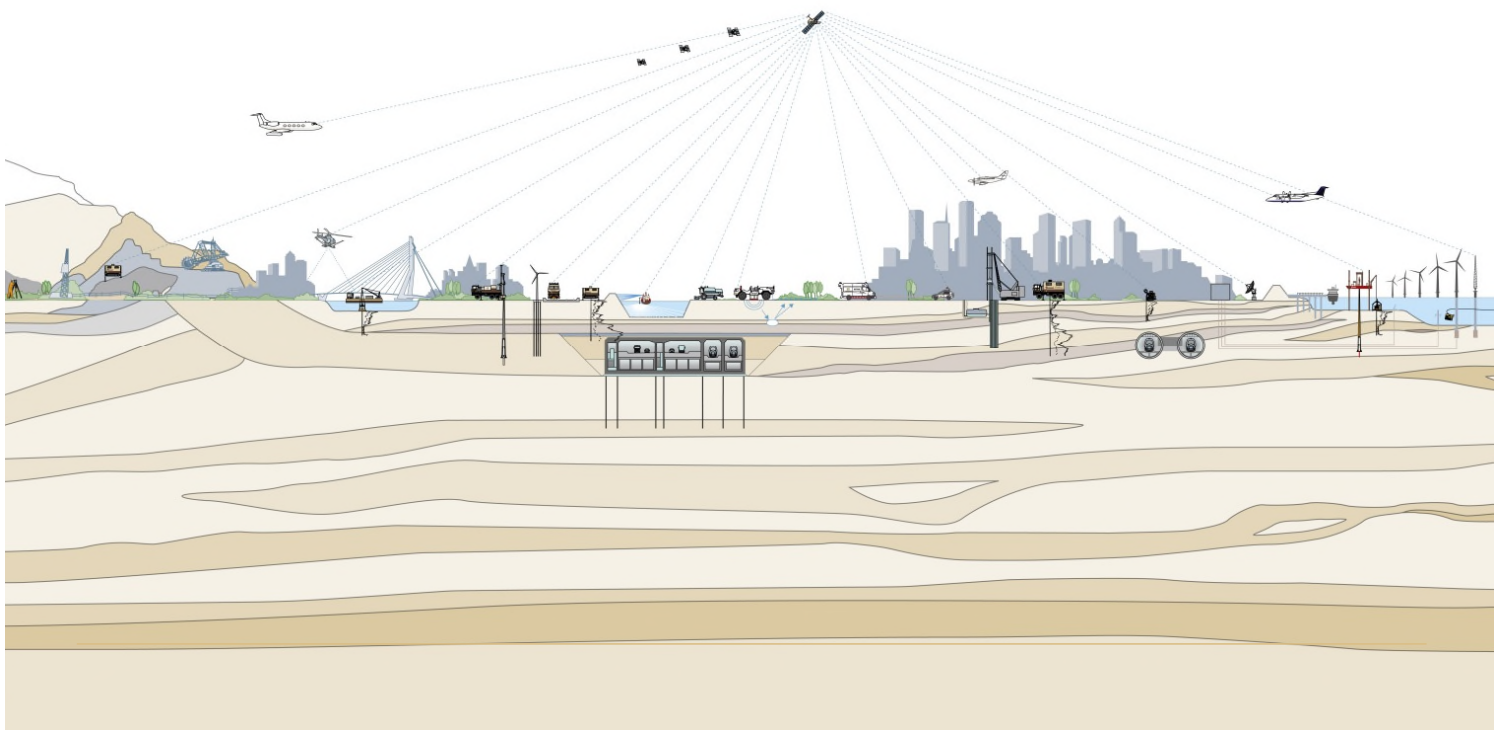
16 August to 24 October 2020
Fugro Project No.: 170202

ANTEA INDIA PRIVATE LIMITED



Volume 2

Factual



**Detailed Factual Report
Geotechnical Investigation For Integrated
Urban Regeneration and Water Transport
Project (IURWTS), Kochi
Kerala, India**

16 August to 24 October 2020
Fugro Project No.: 170202

Volume 2

Prepared for: ANTEA INDIA PRIVATE LIMITED
Magnum Towers, Tower 1,
Unit No. 219-221, 2nd Floor,
Golf Course Extension Road,
Sector 58, Gurugram-122001
Haryana, India



03	Report	ISH	SJ	SM	16 December 2020
02	Report	ISH	SJ	SM	07 December 2020
01	Report	SG/ ISH	ISH/SJ	SM	30 October 2020
Issue	Report Status	Prepared	Checked	Approved	Date

PROJECT : Geotechnical Investigation for Integrated Urban Regeneration & Water Transport Project (IURWTS)										TYPE OF BORING : Rotary borehole drilling, sampling and testing																			
CLIENT : Antea India Private Limited										BORE HOLE DIA : 150 mm																			
LOCATION : Elamkulam STP										GWT : 0.80 m																			
BORE HOLE NO. : CLC LBH-20										CASING DEPTH (m) : SX:11.50m/HX:25.50m/NX:40.00																			
CO-ORDINATES : N 1102509.00 E 643215.00										DATE OF COMMENCEMENT : 15/10/2020																			
RL : 1.60 m										DATE OF COMPLETION : 17/10/2020																			
DEPTH BELOW EGL (m)	TEST DEPTH (m)	SAMPLE TYPE	STANDARD PENETRATION TEST						PROFILE	DESCRIPTION	ROCK DRILLING					LABORATORY TEST RESULTS													
			(N ₁)	(N ₂)	(N ₃)	"N" (blows/mm)	"N _{ex} "	"N _c "			CR [%]	SCR [%]	RQD [%]	WG	FF	CLAY [%]	SILT [%]	SAND [%]	GRAVEL [%]	LL [%]	PL [%]	PI [%]	NMC [%]	DST		UUT		UCS [MPa]	
0	0.00 - 0.50	DS-1							•	0.00 m to 4.00 m - Loose brown to reddish brown to dark grey clayey subangular to subrounded fine to medium SAND, with silt, gravel & organic matter						19	14	67	0										
1									•																				
2	1.50 - 1.95	SPT-1	2	3	4	7		10	•																				
3	2.50 - 3.00	DS-2							•									15	8	63	14	25	14	11					
	3.00 - 3.45	SPT-2	2	2	3	5		7	•																				
4	4.00 - 4.45	UDS-1							•	4.00 m to 13.00 m - Soft to firm dark grey silty CLAY with traces of sand						37	33	24	6	151	40	111	75			21	5		
5	4.50 - 4.95	SPT-3	1	2	1	3		3	•																				
6	5.50 - 6.00	DS-3							•								35	35	30	0	115	33	82						
	6.00 - 6.45	SPT-4	1	1	2	3		3	•																				
7	7.00 - 7.50	DS-4							•																				
8	7.50 - 7.95	SPT-5	2	2	2	4		4	•							29	32	38	1	131	35	96							
9	8.50 - 9.00	DS-5							•																				
	9.00 - 9.45	SPT-6	1	2	3	5		5	•							23	34	43	0	146	36	110	91			17	3	28	
10	9.50 - 9.95	UDS-2							•																				
11	10.50 - 10.95	SPT-7	1	2	1	3		3	•							39	40	21	0	123	34	89							
12	11.50 - 12.00	DS-6							•							47	36	16	1	108	32	76							
	12.00 - 12.45	SPT-8	2	3	4	7		7	•																				
13	13.00 - 13.50	DS-7							•	13.00 m to 25.00 m - Firm to stiff dark grey to brownish black CLAY, with organic matter						54	36	6	4	138	37	101							
14	13.50 - 13.95	SPT-9	2	2	3	5		5	•																				

SPT - Standard Penetration Test
CR - Core Recovery

UDS - Undisturbed Sample
RQD - Rock Quality Designation

DS - Disturbed Sample
WG - Weathering Grade

n.i. - non-intact core (Fracture index >10)
Blank values indicate that no fractures were observed.

FF - Fracture Frequency
SCR - Solid Core Recovery

PROJECT : Geotechnical Investigation for Integrated Urban Regeneration & Water Transport Project (IURWTS)										TYPE OF BORING : Rotary borehole drilling, sampling and testing																		
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LOCATION : Elamkulam STP										GWT : 0.80 m																		
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CO-ORDINATES : N 1102509.00 E 643215.00										DATE OF COMMENCEMENT : 15/10/2020																		
RL : 1.60 m										DATE OF COMPLETION : 17/10/2020																		
DEPTH BELOW EGL (m)	TEST DEPTH (m)	SAMPLE TYPE	STANDARD PENETRATION TEST						PROFILE	DESCRIPTION	ROCK DRILLING					LABORATORY TEST RESULTS												
			(N ₁)	(N ₂)	(N ₃)	"N" (blows/mm)	"N _{ex} "	"N _c "			CR [%]	SCR [%]	RQD [%]	WG	FF	CLAY [%]	SILT [%]	SAND [%]	GRAVEL [%]	LL [%]	PL [%]	PI [%]	NMC [%]	DST		UUT		UCS [MPa]
14	15.00 - 15.45	SPT-10	1	3	2	5		5	=	13.00 m to 25.00 m - Firm to stiff dark grey to brownish black CLAY, with organic matter						50	37	11	2	140	37	103						
15																												
16																												
17																												
18																												
19																												
20																												
21																												
22																												
23																												
24	24.00 - 24.45	SPT-16	4	5	6	11		11	=	25.00 m to 28.00 m - Very stiff light brown to reddish light grey CLAY, with gravel & organic matter						114	33	81										
25																												
26																												
27																												
28																												

SPT - Standard Penetration Test
CR - Core Recovery

UDS - Undisturbed Sample
RQD - Rock Quality Designation

DS - Disturbed Sample
WG - Weathering Grade

n.i. - non-intact core (Fracture index >10)
Blank values indicate that no fractures were observed.

FF - Fracture Frequency
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PROJECT : Geotechnical Investigation for Integrated Urban Regeneration & Water Transport Project (IURWTS)										TYPE OF BORING : Rotary borehole drilling, sampling and testing																		
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DEPTH BELOW EGL (m)	TEST DEPTH (m)	SAMPLE TYPE	STANDARD PENETRATION TEST						PROFILE	DESCRIPTION	ROCK DRILLING					LABORATORY TEST RESULTS												
			(N ₁)	(N ₂)	(N ₃)	"N" (blows/mm)	"N _{ex} "	"N _c "			CR [%]	SCR [%]	RQD [%]	WG	FF	CLAY [%]	SILT [%]	SAND [%]	GRAVEL [%]	LL [%]	PL [%]	PI [%]	NMC [%]	DST		UUT		UCS [MPa]
28	28.00 - 28.50	DS-16							=	28.00 m to 34.00 m - Very stiff dark grey CLAY, with organic matter						71	28	1	0	105	31	74						
29	28.50 - 28.95	SPT-19	4	7	10	17		17																				
30	29.50 - 30.00	DS-17																75	24	1	0	106	32	74				
	30.00 - 30.45	SPT-20	5	8	12	20		20	=																			
31	31.00 - 31.50	DS-18																										
32	31.50 - 31.95	SPT-21	6	8	11	19		19																				
33	32.50 - 33.00	DS-19														41	36	23	0	63	22	41						
	33.00 - 33.45	SPT-22	7	9	12	21		21																				
34	34.00 - 34.50	DS-20							=	34.00 m to 37.50 m - Medium dense dark grey clayey SAND with silt & organic matter						21	10	69	0	25	13	12						
35	34.50 - 34.95	SPT-23	7	10	12	22		14																				
36	35.50 - 36.00	DS-21																										
	36.00 - 36.45	SPT-24	8	10	13	23		15																				
37	37.00 - 37.50	DS-22														20	11	67	2	29	13	16						
38	37.50 - 37.95	SPT-25	16	27	34	61		26		37.50 m to 40.38 m - Very dense brownish grey silty clayey SAND with gravel																		
39	38.50 - 39.00	DS-23															11	11	76	2	28	16	12		3	35		
	39.00 - 39.45	SPT-26	19	31	37	68		28																				
40	40.00 - 40.38	SPT-27	14	37	60	60/80	149	52										91	1									
41																												
42																												

SPT - Standard Penetration Test
CR - Core Recovery

UDS - Undisturbed Sample
RQD - Rock Quality Designation

DS - Disturbed Sample
WG - Weathering Grade

n.i. - non-intact core (Fracture index >10)
Blank values indicate that no fractures were observed.

FF - Fracture Frequency
SCR - Solid Core Recovery

ANNEXURE 5 ESTIMATES

Consultant:



ANNEXURE 5 ESTIMATES

Project:




IURWTS

Client:



Cost Summary for 17.50 MLD plant at Elamkulam and Sewer network with appurtenant structures for Chilavanoor and Thevara Perandoor Canal South Catchments prepared based on PRICE software using DSR 2018.

Sl. No.	Description of works	Estimated cost in INR
1(a)	Design and build SBR Sewage Treatment Plant of 17.5MLD installed capacity and all appurtenant structures and allied works including Wet Well [1 no.] for collection of raw sewage form Block 6 at STP site.	45.50 Crores
1(b)	Operation & Maintenance for a period of 10 years including defect liability period of 24 months [O&M– INR 18.10 Crores & Electrical Energy– INR 11.22 Crores]	29.32 Crores
2 (a)	Collection system of Elamkulam includes laying of sewer lines [135Km], Construction of Manholes [5308 nos.], Lift Manholes [7 nos.], Sewage Pumping Station [5 nos.] Pumping Main [4 nos. PM1-300DI K9-2.03km for WW1 to WW2, PM2-350mm DI K9-3.5km for WW2 to STP, PM3-WW3 to existing KWA WW-2.55km and PM4-WW4 to STP 300mm DI K9-300m] and providing Household Service connections [14651 nos.]	242.72 Crores
2 (b)	Operation & Maintenance for a period of 10 years including defect liability period of 24 months [O&M– INR 18.47 Crores & Energy Cost– INR 4.64 Crores]	23.12 Crores
3	Land acquisition for pumping station [15 cents for Thevara wet well], 15 cents for WW2 at Kathrikkadavu WW4	1.31 Crores
4	Preparation Detailed Project Report for the Sewerage Scheme for Elamkulam Zone @1.5% of the total estimate Amount	5.13 Crores
5	Supervision charges for the execution of the entire sewerage scheme @ 6% of the Estimate cost	20.53 Crores
	Total Project Cost	367.63 Crores

Consultant: 	ANNEXURE 5 ESTIMATES 17.50 MLD Elamkulam STP & Sewer network	Project: 	Client: 
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ANNEXURE 5

ESTIMATES-SEWER NETWORK

Consultant:



ANNEXURE 5 ESTIMATES

Project:

IURWTS

Client:



SEWE NETWORK - ELAMKULAM GENERAL ABSTRACT		
General Abstract - Construction and Commissioning of Elamkulam Sewerage system comprising Collection System with Wet well/Pumping station 4 nos and Lift Stations 7 nos		
		Est Cost Rs 265.84 Crore
S. No	Description	Amount Rs in Crore
CAPITAL COST		
1	Supply & Delivery, laying, jointing, testing, trial run, and commissioning of sewer lines for Elamkulam Collection System, including earth work excavation, side protection arrangements, Site safety measures, dewatering, proper bedding for sewers to facilitate the designed slope vital for gravity flow, refilling haunch/crown portions, backfills in layers as per standard specifications, etc complete.	54.09
2	Construction of RCC M30 Concrete Manholes of 1.2m and 1.5m diameter using sulphate resistant Cement and corrosion resistant steel reinforcement for Elamkulam sewer network system, including earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, M20 concrete for benching and channeling, manhole base slab, side walls, , centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anti-corrosive bituminous paint to the outer surfaces, supply and fixing of SFRC-EHD Manhole cover of 600mm diameter, de-watering with suitable pumpset conveyance, erection, commissioning , dismantling and taking back, cost of fuel lubricating oil and other stores, side protection with close timbering, site protection and safety measures,provision of pipe connection for inlet, outlet and Sewer service connection pipes, providing danger lights, barricades etc complete	52.35
3	Construction of RCC M30 Concrete Lift manholes of 2.5m diameter or more for Elamkulam sewer network system, includes earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc and nonclog submersible pumpsets and compatible Silent Type Diesel Generator set with AMF panels meeting the CPCB norms, stringing ABC lines along roads and availing KSEB supply and commissioning etc complete	1.17

S. No	Description	Amount
		Rs in Crore
4	Design,Supply & delivery, construction and commissioning of all allied components for Pumping Stations 4 nos (Wet-well 4 nos) for Wet-well1 (Block 12A),Wet-well 2 (Block 12B), Wet well 3 (Block 7) and Wet well 4 (Block 5) with allied components as per standard specifications, and supply,erection, delivery trial run and commissioning of non-clog submersible pumpsets for 1DWF, 2DWF and 3 DWF as per Pump operating plan designed therefor , including pumpset, pipe connections, valves, chambers rooms, electrical connections and allied accessories, compatible capacity silent type generator set of reputed make meeting CPCB norms ABC stringing lines along the roads of reputed miring,mounting,roofing sheets, with AMF panels, change over switches etc.complet LT supply from KSEB for the Pumping Stations including trial run a Odour Control Arrangements,Compound wall with Main and wicket gates peripheral plantations and commissioning etc. complete	5.47
5	Supply & Delivery, laying of pumping main including Air and Scour valves to Pumping mains 2 nos for Elamkulam Collection system , including earthwork excavation, dewatering wherever necessary, side protection for trenches, site protection and safety measures during the course of works, barricading, danger lights, signage,refilling and removal of surplus earth as per standard specifications etc complete.	5.19
6	Laying of pipes under railway lines and NH66 by HDD method to Elamkulam STP, including excavation, side protection, mobilization charges, breakdown charges, utility shifting,dewatering includes for all labour,materials and machineries etc. complete.	0.87
7	Road restoration charges for BM&BC and CC roads (PWD Road)	55.37
8	House-hold sewer service connection including earthwork,road cutting, supply, delivery, laying and joining etc for 110mm/160mm uPVC pipe along with inspection chamber, pipe connections, joineries etc complete until commissioning of house sewer connections comprising both connections from Manhole to house boundary and inside premises upro the junction chamber until serviceable conditions.	25.91
9	Supply & Delivery including insurance, registration and allied costs for Sewer cleaning and Flushing vehicles comprising HCV Truck mounted (16 T GVW)Super Suction (High-Vacuum) cum High pressure Sewer Jetting Machine (1 no) amenable for smaller streets also, LCV mounted Suction cum Pressure Jetting/ rodding machine (1 no), Grab bucket machine for Manhole silt removal (1 no) and Sewer Flushing Tanker (1 no) for ease of cleaning, clearing and maintenance with dignity compliant to MS Act,2013, Noise & safety standards and ms with all statutory norms/clearnces/applicable MV Act provisions including all accessories, Non-Motorised Manhole cleane(5 nos) complete as per sturdy standards and specifications and commissioning etc complete	1.74
10	Utility shifting works and its restoration as directed by the Department	2.04
11	Additional cost for SCADA, Solar system for sewer network system	1.50
	Sub Total Item [1+12]	205.69
	Provision for GST Payment @ 18%	37.02
	Total -1	242.72

S. No	Description	Amount
		Rs in Crore
ANNUAL MAINTENANCE FOR 10 YEARS [OPERATIONAL COST]		
12	Annual maintenance for sewer network , lift manhole automation , pump sets, wetwell cum pump stations and energy charges etc for 10 Years	
12.1	O& M Cost excluding Electrical Energy for 10 years	15.65
12.2	Electrical Energy Cost for 10 years	3.94
	Sub Total [Item 7]	19.59
	Provision for GST Payment @ 18%	3.53
	Add for sundries	0
	Total -2	23.120
	Grand Total	265.84

(Rupees Two Hundred Sixty Five Crore and eighty four lakh only)

ELAMKULAM COLLECTION SYSTEM

SI No	Item	Qty		Rate	Amount	
1	Sewer Lines (Details vide page.... and Item nos ... to.... of Price Estimate)					
1	15.43.2 Dismantling	98010.471	Sqm	360.94	35375899.4	
2	Cutting and removal of	14001.506	Sqm	227.92	3191223.248	
3	Taking out paver blocks	28003	Sqm	110.71	3100212.13	
4	15.2.2 Demolishing CC	2836.727	Cum	1262.82	3582275.59	
5	15.3 Dismantling RCC	39.375	Cum	2983.59	117478.8563	
6	15.2 Demolishing RR	324	Cum	2064.97	669050.28	
7	100.1.1 Earthwork	180861.905	Cum	555.51	100470596.8	
8	100.1.2 Earthwork	60492.125	Cum	661.88	40038527.7	
9	100.1.3 Earthwork	15560.368	Cum	768.25	11954252.72	
10	100.1.4 Earthwork	1936.507	Cum	874.62	1693707.752	
11	100.8.1 Fencing	67541	m	28.01	1891823.41	
12	2.16.1 Close timbering	106713.688	Sqm	152.95	16321858.58	
13	2.16.2 Close timbering	66498.298	Sqm	166.17	11050022.18	
14	2.16.3 Close timbering	27393.688	Sqm	196.06	5370806.469	
15	OD Steel shoring	20660.878	Sqm	776.89	16051229.51	
16	100.7.1 Bailing out water	14174	kwh	36.95	523729.3	
17	100.7.2 Bailing out water	4476	kwh	18.44	82537.44	
18	60.2.7 Bailing out cooling	100	day	878.76	87876	
19	S&L 200mm DWCPipe	117662.3	m	522.67	61498554.34	
20	S&L 250mm DWCPipe	5488.5	m	838.6	4602656.1	
21	S&L 300mm DWCPipe	946	m	1134.79	1073511.34	
22	S&L 400mm PEpipe	1473.5	m	8954.05	13193792.68	
23	S&L 450mm PEpipe	995	m	10479.3	10426913.45	
24	S&L 500mm PEpipe	842.5	m	14026.4	11817242	
25	S&L 560mm PEpipe	609	cum	16409.5	9993409.86	
26	S&L 630mm PEpipe	362	cum	20414.3	7389958.5	
27	7.1.1 RRM	194.4	cum	7204.78	1400609.232	
28	RRm w/orubble	129.6	cum	5472.39	709221.744	
29	Construction of drains	2836.727	Cum	13523.8	38363271.87	
30	16.68 supply and Paver	16801.8	Sqm	1011.57	16996196.83	
31	16.84 laying cc blocks	11201.2	Sqm	381.62	4274601.944	
32	Sand Gravel Mix	27924.74	Cum	2548.23	71158660.21	
33	Stone dust	17329.961	Cum	2102.04	36428271.22	
					540899978.7	540899978.7
2	Sewer Manholes (Details vide page.... and Item nos ... to.... of Price Estimate)					
	1.2 dia 1.3 depth	2415		65945.4	159258165.2	
	1.2 dia 1.75 depth	1221		77589.6	94736913.81	
	1.2 dia 2.25 depth	615		111913	68826587.25	
	1.5 dia 2.75 depth	377		159117	59987120.31	
	1.5 dia 3.25 depth	265		182844	48453771.3	
	1.5 dia 3.75 depth	211		204076	43059972.7	
	1.5 dia 4.25 depth	127		230766	29307240.09	
	1.5 dia 4.75 depth	59		253001	14927073.16	
	1.5 dia 5.25 depth	18		274590	4942620.36	
		5308			523499464.1	523499464.1

ELAMKULAM COLLECTION SYSTEM

SI No	Item	Qty	Rate	Amount	
3	Lift Manholes (Details vide page.... and Item nos ... to.... of Price Estimate)				
1	2.5m dia 5.35 m depth	1	N 499112	499112.49	
2	3.5m dia 5m depth	1	N 611679	611678.75	
3	2.5m dia 6.13m depth	1	N 552934	552934.17	
4	3m dia 6.25m depth	1	N 679364	679364.2	
5	2.5m dia 4.99m depth	1	N 417858	417857.95	
6	2.5m dia 5.51m depth	1	N 510097	510096.57	
7	2.5m dia 6.01m depth	1	N 542452	542451.77	
8	nonclog submercible pu	1	N 455627	455627.41	
9	ubmercible pumpset of	5	N 404708	2023538	
10	nonclog submercible pu	1	N 385051	385051.23	
11		1	N	0	
12		1	N	0	
13		1	N	0	
14		1	N	0	
15		6	N	0	
Specify the item			6677712.54	6677712.54
	iii) Silent Type Diesel G	7	LMH	50,00,000	
				11677712.54	

ELAMKULAM COLLECTION SYSTEM					
Sl No	Item	Qty		Rate Rs in lakh	Amount
1	Wet well 1	1	nos	65.48	65,48,000
2	Wet well 2	1	nos	111.3	1,11,21,000
3	Wet well 3	1	nos	88.1	88,10,000
4	Wet well 4	1	nos	104.9	1,04,90,000
5	Add Compound wall & Gense	vide G10			1,77,48,000
	Total For 4 Pumping Stations	Rs 547.17 lakh			5,47,17,000
	i). Compound wall	4	sites	17.62	70,48,000
	ii) Silent Type Diesel Genset	4	PS	157	1,07,00,000
	iii) Silent Type Diesel Genset	7	LMH		50,00,000
					1,77,48,000

ELAMKULAM Pumping main					
Sl No	Item	Qty		Rate	Amount
1	2.10.1.3 Excavating trenches exceeding 300 mm dia but not exceeding 600 mm	8380	metre	669.27	5608482.6
2	100.7.1 Bailing out water with 5 HP	2500.594	Kwh	36.95	92396.9483
3	60.2.7 BAILING OUT WATER BY ENGAGING COOLIE	114	Day	878.76	100178.64
4	steel sheet shoring	5720	sqm	407.25	2329470
5	2.16.1 Close timbering in trenches	3173	sqm	152.95	485310.35
6	100.14.5- 300 mm dia Ductile Iron Class K-9 Pipes	2030	metre	205.15	416454.5
7	350 mm dia Ductile Iron Class K-9 Pipes	6350	metre	271.79	1725866.5
8	18.30.7- 300 mmdiameter pipe	2	no	578.43	1156.86
9	18.30.8- 350 mmdiameter pipe	6	no	777.41	4664.46
10	18.70.5- 300 mm dia pipe	364	joint	412.6	150186.4
11	18.70.6- 350 mm dia pipes	1156	joint	437.75	506039
12	18.83.7-300 mm diameter C.I. pipe	20	Each Cut	643.44	12868.8
13	18.83.8- 350 mm diameter C.I pipe	64	Each Cut	748.32	47892.48
14	100.35.5 Testing 300mm DI/CI pipeline with potable water to the required test pressure.	2030	metre	55.59	112847.7
15	100.35.6Testing 350mm DI/pipeline with potable water to the required test pressure.	6350	metre	67.85	430847.5
16	100.98.119 Supply of DI K9 Pipe Conforming to IS 8329/2000, 300mm Dia	2030	metre	3537.65	7181429.5
17	100.98.120 Supply of DI K9 Pipe Conforming to IS 8329/2000, 350mm Dia.	6350	metre	4333	27514550
18	18.69.1 Providing and laying D.I Specials of Class K - 12 suitable for mechanical jointing as per IS : 9523 :Upto 600 mm dia	51.792	quintal	21145.26	1095155.306
19	Providing, laying and fixing C.I. sluice valves	3	no	64876.62	194629.86
20	Supplying and fixing C.I double acting air valve	8	no	7363.73	58909.84
21	5.2.2 Reinforced cement concrete work	46.401	cum	10954.04	508278.41
22	Extra for providing sulphate resistant cement	46.401	cum	1916.05	88906.63605
23	5.22.6 Steel reinforcement for R.C.C work	3712.081	kilogram	98.3	364897.5623
24	13.52.1 Finishing with Epoxy paint	188.574	sqm	223.32	42112.34568
25	50.2.25.1 Filling with contractor's own earth (excluding rock)	1161.803	cum	525.82	610899.2535
26	51.2.3 Filling with Quarry Muck	1161.803	cum	902.34	1048341.319
27	Construction valve chamber of 2.00mx2.00x2.2m	1	set	1181526	1181525.86
					51914298.63

ELAMKULAM COLLECTION SYSTEM					
SI No	Item	Qty		Rate	Amount
Laying of pipes under NH 66 and PWD Road by HDD method to Elamkulam STP					
1	Drilling of 600mm dia horizontal borehole for pipeline under the Railway	185	metre	10646.3	1969567.35
2	Drilling of 1300mm dia horizontal borehole for pipeline under the Railway	45	metre	42491.2	1912101.75
					3881669.1
Laying of pipes under railway lines by HDD method to Elamkulam STP					
1	Drilling of 600mm dia horizontal borehole for pipeline under the Railway	450	metre	10646.3	4790839.5
ROAD RESTORATION CHARGES					
8	Road Restoration Charges for BM&BC as per the directions of Engineer (PWD)	147016	per sqm	3167.05	465606091.7
9	Road Restoration Charges for CC roads as per the directions of Engineer (PWD)	21002.3	per sqm	4195.88	88122933.32
					553729025

ELAMKULAM HOUSEHOLD CONNECTION					
SI No	Item	Qty		Rate	Amount
1	Carrying out Household Survey for Sewerage System	14651	each	74.41	1090180.91
2	Providing sewer connection to the existing households	14651	no	14900.62	218308983.6
3	Suupplying conveying and laying pipes and specials ISI marked 160mm dia	2940	per metre	981.33	2885110.2
4	Supplying, laying , jointing and testing 110 mm dia UPVC pipes	71785	metre	512.22	36769712.7

259053987.4

Sewer Cleaning Vehicles					
SI No	Item	Qty		Rate	Amount
1	Purchasing LCV mounted sewer suction cum Jetting machine of 4000 liters tank capacity	1	no	4556258.05	4556258.05
2	Supply, testing and commissioning Hydraulic operated cum Winch Driven De-Silting Grab Bucket System	1	set	862597.01	862597.01
3	Supplying, testing and Commissioning Jetting machinery inclusive of Four wheeler	1	set	890422.98	890422.98
4	Providing operationg Non-Motorised Manhole cleaner	5	set	20000	100000
5	Vehicle Mounted High Pressure Jetting cum Sewer Suction Machine	1	set	5999999.99	5999999.99
6	Vehicle Mounted High Pressure Jetting cum Sewer Suction Machine chassis mounted on a vehicle of 9 T GVW	1	set	5000000	5000000
					17409278.03

AMC FOR SEWER NETWORK ELAMKULAM FOR 10 YEARS

AMC Collection System- Maintenance including SPS 4 nos & 7 LiMs	
Annual Mace for 1 st Year Estimate attached includes materials and labour and conveyance charges if any (Without GST) From Estimate including pumpsets, Generator for main pumping station and lift manholes	0.00
Annual Mace for 2nd Year	0.00
Annual Mace for 3rd Year (5 % increase)	72,36,302.52
Annual Mace for 4th Year (5 % increase)	75,98,117.65
Annual Mace for 5th Year (5 % increase)	79,78,023.53
Annual Mace for 6th Year (10 % increase)	87,75,825.89
Annual Mace for 7th Year (10 % increase)	96,53,408.47
Annual Mace for 8th Year (10 % increase)	1,06,18,749.32
Annual Mace for 9th Year (15 % increase)	1,22,11,561.72
Annual Mace for 10th Year (20 % increase)	1,46,53,874.06
Total AMC for 10 Years	7,87,25,863.17
Say Rs 620.12 lakh	78725863.00

AM- Cost of Electrical Energy	
	Rs
Annual Mace for 1st Year Estimate attached for energy charges (Without GUT) From Estimate	31,36,000.00
Annual Mace for 2nd Year	32,92,800.00
Annual Mace for 3rd Year (5 % increase)	34,57,440.00
Annual Mace for 4th Year (5 % increase)	36,30,312.00
Annual Mace for 5th Year (5 % increase)	38,11,827.60
Annual Mace for 6th Year (5 % increase)	40,02,418.98
Annual Mace for 7th Year (5 % increase)	42,02,539.93
Annual Mace for 8th Year (5 % increase)	44,12,666.93
Annual Mace for 9th Year (5 % increase)	46,33,300.27
Annual Mace for 10th Year (5 % increase)	48,64,965.29
Total AMC for 10 Years	3,94,44,270.99
AMC for 10 year O&M- Electrical Energy	Rs 369.28 lakh

Abstract of AMC for 10 year O & M cost

1) Manpower Charges for O& M	777.61563	7,77,61,563.00	
2) Maintenance	787.25863	78725863.00	
3) Electrical Energy	394.4427099	3,94,44,270.99	
Total Cost of O& M	1959.31697	19,59,31,696.99	610.4442476
O& M Excluding Energy Charges	1564.87426		

ENERGY DEMAND & CONSUMPTION COST FOR COLLECTION SYSTEM							
1	Calculation of Electrical Energy demand and energy Consumption						
Abstract of Power Load & Consumption:							
S no	Component	Inst HP	Inst KW	Run time	Kw Hr per Day		
1	WW-4 nos 3 DWF	240 HP	180 kw	7 hrs	1260		
2	LiMs -7 nos 2 DWF	2*7 HP	12 KW	14 hrs	168		
3.1	Total Unit per Day (1)+(2)		192 KW		1428 Kw Hr		
3.2	Total Unit per Month		30*1428		42,840 Kw hr		
4.1	Energy Cost per month @Rs6.10/-		6.1*42840		261324		
4.2	Energy Cost per annum		12*261324		31,35,388/-		
	Energy charges payable /annum	₹ 31,36,000	Rs in Lakh				

1.1 ESTABLISHMENT CHARGES						
SL. No	Location	Description	Nos	Wage/ Month	Cost per Month	Cost per Annum
1	Sewer network 135.082km	Sewer Inspector	2	22,000.00	44,000.00	
2		Helper/Maintenance Assistant for Sewer Network, Manhole maintenance and collection system	4	15,000.00	60,000.00	
5		Fitter/Technician	4	20,000.00	80,000.00	
7		Maintenance Assistant/HSC cleaning-1no/4000 connections	4	15,000.00	60,000.00	
1	Pumping station 4nos. Lift manhole 7nos	Electrician for Sewage Pumping Stations(4nos) & Lift Stations(7nos)	8	18,000.00	1,44,000.00	
2		Helper cum Maintenance Assistant for SPS && LiSs	4	15,000.00	60,000.00	
		Total	26		4,48,000.00	53,76,000.00
Add contractor's profit 15% Total					5,15,200.00	61,82,400.00
						61,82,400.00

1.7 SCADA Components and its Estimates					
Sl.No.	Description	Qty.	Unit	Unit Price	Total Price
1	RAW SEWAGE - WATER QUALITY SENSOR AND DISPLAY UNIT				
1a	BOD ₅	1	No.	19,80,000	19,80,000
1b	COD	1	No.		
1c	TSS	1	No.		
1d	TKN (as N)	1	No.		
1e	TP (as PO ₄)	1	No.		
2	TREATED SEWAGE - WATER QUALITY SENSOR AND DISPLAY UNIT				
2a	BOD ₅ @ 20° C	1	No.	19,80,000	19,80,000
2b	COD	1	No.		
2c	TSS	1	No.		
2d	TN (as N)	1	No.		
2e	TP (as PO ₄)	1	No.		
3	COARSE SCREEN CHANNEL: MECHANICAL				
3a	Head Loss across Screen - Sensor	1	Set	78,000	78,000
4	COARSE SCREEN CHANNEL: MANUAL				
4a	Head Loss across Screen	1	Set	78,000	78,000
5	Pumping Station				
5a	Mechanical Coarse Bar Screen - Starter (1.5kW)(1W)	1	No.	65,000	65,000
5b	Flat Belt Conveyor - Starter (1.5kW)(1W)	1	No.	65,000	65,000
5c	Raw Sewage Pump-1 - VFD Starter Panel (37kW) (1W+1SB)	2	Nos.	2,65,000	5,30,000
5d	Raw Sewage Pump-2 - VFD Starter Panel (75kW)(1W+1SB)	2	Nos.	4,56,000	9,12,000
5e	Raw Sewage Pump-3 - VFD Starter Panel (180kW)(1W)	1	No.	5,34,000	5,34,000
5f	Level Sensor	3	Nos	45,000	1,35,000
5g	Pressure Sensor	3	Nos	18,900	56,700
5h	Sensor Hook up System	6	lot	23,500	1,41,000
6	STP				
6a	Mechanical Fine Bar Screen (1.5 kW) - VFD Starter Panel (1W)	1	No.	65,000	65,000
6b	Flat Belt Conveyor - (1.5kW) VFD Starter Panel (1W)	1	No.	65,000	65,000
7	Grit Chamber				
7a	a. Scraper Mechanism - VFD Starter Panel (1.5 kW) (1W+1SB)	2	Nos	65,000	1,30,000
7b	b. Classifier Mechanism - VFD Starter Panel (1.5 kW) (1W+1SB)	2	Nos	65,000	1,30,000
7c	c. Organic Return Pumps - VFD Starter Panel (1.5 kW) (1W+1SB)	2	Nos	65,000	1,30,000
7d	SBR Air Blowers (Tri-Lobe Blowers) - VFD Starter Panel (180kW)	3	Nos	5,34,000	16,02,000
7e	RAS Pumps - VFD Starter Panel - 7.5kW (2W)	2	Nos	1,25,000	2,50,000
7f	Decanters - VFD Starter Panel - 0.55kW (2W)	2	Nos	55,000	1,10,000
7g	SAS Pumps - VFD Starter Panel - 11kW (2W)	2	Nos	1,48,000	2,96,000
7h	Auto Valves/Sluice Gates - Motorized Actuator (0.55) (8W)	8	Nos	1,88,900	15,11,200
7i	Level Sensor	1	No.	45,000	45,000
7j	Pressure Sensor	3	Nos.	18,900	56,700
7k	Sensor Hook up System	4	lot	23,000	92,000
8	Chlorination System				
8a	a. Water Booster Pumps - VFD Starter Panel - 3.7kW (1W+1SB)	2	Nos	98,000	1,96,000
8b	b. NaOH Recirculation Pump - VFD Starter Panel - 2.2kW (1W)	1	Nos	69,000	69,000
8c	c. Air Blower - VFD Starter Panel - 1.5kW (1W)	1	Nos	65,000	65,000
8d	Sludge Sump Mixers VFD Starter Panel - 1.1kW (1W)	1	Nos	61,500	61,500
8e	Centrifuge - VFD Starter Panel - 30kW (1W+1SB)	2	Nos	2,67,800	5,35,600
8f	Centrifuge Feed Pumps - VFD Starter Panel - 5.5kW(1W+1SB)	2	Nos	1,23,000	2,46,000
8g	Residual Chlorine sensor	1	No.	73,000	73,000
8h	Free Chlorine Sensor	1	No.	67,800	67,800
8i	Level Sensor	2	Nos	45,000	90,000
8j	Pressure Sensor	3	Nos.	18,900	56,700
8k	Sensor Hook up System	7	lot	23,800	1,66,600

Sl.No.	Description	Qty.	Unit	Unit Price	Total Price
9	Dewatering Polymer Dosing System				
9a	a. Agitators for Dosing Tanks - VFD Starter Panel - 1.1kW (2W)	2	Nos	61,500	1,23,000
9b	b. Dosing Pumps - VFD Starter Panel- 1.5kW (1W+1SB)	2	Nos	65,000	1,30,000
9c	Service Water Pumps - VFD Starter Panel - 2.2kW (1W+1SB)	2	Nos	69,000	1,38,000
9d	Level Sensor	2	Nos	45,000	90,000
9e	Pressure Sensor	3	Nos.	18,900	56,700
9f	Sensor Hook up System	5	lot	23,900	1,19,500
10	RTU/PLC Panel				
10a	RTU/PLC Panel	1	No.	7,89,000	7,89,000
10b	Battery Power Back-up	1	set	2,45,000	2,45,000
10c	GSM-GPRS unit	1	No.	12,000	12,000
10d	Antenna	1	No.	8,900	8,900
10e	Earth Pit	3	No.	22,500	67,500
10f	Field Cable	1	Lot		-
10g	Monitoring and Control Unit	1	No.	5,67,800	5,67,800
10h	SCADA Software	1	No.	3,28,000	3,28,000
10i	solar Power back-up for the electronics unit	1	No.	3,45,000	3,45,000
11	SEWAGE COLLECTION AND PUMPING SYSTEM				
11.1	LOCATION - 1				
a	Sewage Pumping System from the collection sump - VFD Starter Panel - 1.1kW (1W+1SB)	2	Nos.	61,500	1,23,000
b	RTU/PLC PANEL Integration with GSM-GPRS system to STP SCADA System with 24 Hour Power Back-up	1	No.	1,79,000	1,79,000
c	Level Sensor	1	No.	45,000	45,000
d	Pressure Sensor	1	No.	18,900	18,900
e	Multi-function energy fitted inside the VFD starter panel with Current Transformer	1	No.	23,000	23,000
f	Maintenance Free Power & Signal Earth	2	Nos,	22,500	45,000
11.2	LOCATION - 2				-
a	Sewage Pumping System from the collection sump - VFD Starter Panel -1.1kW (1W+1SB)	2	Nos.	61,500	1,23,000
b	RTU/PLC PANEL Integration with GSM-GPRS system to STP SCADA System with 24 Hour Power Back-up	1	No.	1,79,000	1,79,000
c	Level Sensor	1	No.	45,000	45,000
d	Pressure Sensor	1	No.	18,900	18,900
e	Multi-function energy fitted inside the VFD starter panel with Current Transformer	1	No.	23,000	23,000
f	Maintenance Free Power & Signal Earth	2	Nos,	22,500	45,000
11.3	LOCATION - 3				-
a	Sewage Pumping System from the collection sump - VFD Starter Panel - 2.2 kW (1W+1SB)	2	Nos.	69,000	1,38,000
b	RTU/PLC PANEL Integration with GSM-GPRS system to STP SCADA System with 24 Hour Power Back-up	1	No.	1,79,000	1,79,000
c	Level Sensor	1	No.	45,000	45,000
d	Pressure Sensor	1	No.	18,900	18,900
e	Multi-function energy fitted inside the VFD starter panel with Current Transformer	1	No.	23,000	23,000
f	Maintenance Free Power & Signal Earth	2	Nos,	22,500	45,000
11.4	LOCATION - 4				-
a	Sewage Pumping System from the collection sump - VFD Starter Panel - 2.2 kW (1W+1SB)	2	Nos.	69,000	1,38,000
b	RTU/PLC PANEL Integration with GSM-GPRS system to STP SCADA System with 24 Hour Power Back-up	1	No.	1,79,000	1,79,000
c	Level Sensor	1	No.	45,000	45,000
d	Pressure Sensor	1	No.	18,900	18,900
e	Multi-function energy fitted inside the VFD starter panel with Current Transformer	1	No.	23,000	23,000
f	Maintenance Free Power & Signal Earth	2	Nos,	22,500	45,000

Sl.No.	Description	Qty.	Unit	Unit Price	Total Price
11.5	LOCATION - 5				-
a	Sewage Pumping System from the collection sump - VFD Starter Panel - 5.5 kW (1W+1SB)	2	Nos.	1,23,000	2,46,000
b	RTU/PLC PANEL Integration with GSM-GPRS system to STP SCADA System with 24 Hour Power Back-up	1	No.	1,79,000	1,79,000
c	Level Sensor	1	No.	45,000	45,000
d	Pressure Sensor	1	No.	18,900	18,900
e	Multi-function energy fitted inside the VFD starter panel with Current Transformer	1	No.	23,000	23,000
f	Maintenance Free Power & Signal Earth	2	Nos,	22,500	45,000
11.6	LOCATION - 6				-
a	Sewage Pumping System from the collection sump - VFD Starter Panel - 5.5 kW (1W+1SB)	2	Nos.	1,23,000	2,46,000
b	RTU/PLC PANEL Integration with GSM-GPRS system to STP SCADA System with 24 Hour Power Back-up	1	No.	1,79,000	1,79,000
c	Level Sensor	1	No.	45,000	45,000
d	Pressure Sensor	1	No.	18,900	18,900
e	Multi-function energy fitted inside the VFD starter panel with Current Transformer	1	No.	23,000	23,000
f	Maintenance Free Power & Signal Earth	2	Nos,	22,500	45,000
12	COLLECTION WELL PUMPING				-
a	Sewage Pumping System from the collection sump - VFD Starter Panel - 22 kW (1W+1SB)	2	Nos.	2,37,000	4,74,000
b	RTU/PLC PANEL Integration with GSM-GPRS system to STP SCADA System with 24 Hour Power Back-up	1	No.	1,79,000	1,79,000
c	Level Sensor	1	No.	45,000	45,000
d	Pressure Sensor	1	No.	18,900	18,900
e	Multi-function energy fitted inside the VFD starter panel with Current Transformer	1	No.	26,000	26,000
f	Maintenance Free Power & Signal Earth	2	Nos,	22,500	45,000
13	Electrical Hoist with Travelling Trolley				
a	a. 2 HP				
b	b. 3 HP				
14	Utility				
a	Plant Area Lighting				
				Basic Total	1,93,52,500
				Installation and Commissioning charges @ 12%	23,22,300
				Transport Charges @ 5%	9,67,625
				Insurance @ 0.6%	1,16,115
				Financial Charges @ 2%	3,87,050
				Other @ 2%	3,87,050
				Sub Total	2,35,32,640
				GST 18%	42,35,875
				Total	2,77,68,515

Annual Mace for 1st Year Estimate attached for Manpower (Without GST) From Estimate	61,82,400.00
Annual Mace for 2nd Year 5% increase	64,91,520.00
Annual Mace for 3rd Year (5 % increase)	68,16,096.00
Annual Mace for 4th Year (5 % increase)	71,56,900.80
Annual Mace for 5th Year (5 % increase)	75,14,745.84
Annual Mace for 6th Year (5 % increase)	78,90,483.13
Annual Mace for 7th Year (5 % increase)	82,85,007.29
Annual Mace for 8th Year (5 % increase)	86,99,257.65
Annual Mace for 9th Year (5 % increase)	91,34,220.54
Annual Mace for 10th Year (5 % increase)	95,90,931.56
Total AMC for 10 Years	7,77,61,562.81
Say	7,77,61,563.00

5	MAINTENANCE COST			
SL NO	DESCRIPTION	CAPITAL COST Rs.	RATE	ANNUAL MAINTENANCE COST Rs.
2	Mechanical, Electrical & Instrumentation Works @ 2% of Capital Cost	2,50,58,748	2.00%	5,01,175
	TOTAL (Rs./year)	2,50,58,748		5,01,175

Lakh

LiMs 78.642
 SPS 167.032
 Total 245.674
 AME @ 2% 4.913

250.587 Added with Maintenance Cost & factored in 10 Years O& M

Please insert a table to show the base cost of Maintenance for Rs 75 lakh projected in the Base Year(3rd year) since DLP is 2 years

	1.4. MAINTENANCE (Capital Cost =54.09+52.35+1.17+5.47+5.19+0.87 =119.14crore			
SL NO	DESCRIPTION	CAPITAL COST Rs.	RATE	ANNUAL MAINTENANCE COST Rs.
1	Civil Works @ 0.5 % of Capital Cost	1,31,34,97,511.28	0.50%	65,67,488
2	Mechanical, Electrical & Instrumentation Works @ 2% of Capital Cost	2,50,58,748.36	2.00%	5,01,175
	TOTAL (Rs./year)	(Item 1 to 3 7068663+167640 Cell (I 21)		70,68,663

3 Odour control Unit(62.28-6.4=55.88

5588000

3.00%

167640

IURWTS Project-Sewerage Scheme-Collection System Construction of Sewer network for Elamkulam STP17.5MLD including all sewer appurtenances and annual maintenance of 10 years-(FINAL)

General Abstract

(Dsr year: **2018**, Cost Index Applied for this estimate is **35.59%**)

Sl No	Heading Description	Amount
1	Supply & Delivery, laying, jointing, testing, trial run, and commissioning of sewer lines for Elamkulam Collection System	540899978.71
2	Construction of RCC M30 Concrete Manholes of 1.2m and 1.5m diameter using sulphate resistant Cement and corrosion resistant steel reinforcement for Elamkulam sewer network system	523499464.13
3	Construction of RCC M30 Concrete Lift manholes of 2.5m diameter lift manholes for Elamkulam sewer network system	6677712.54
4	Design, Supply & delivery, construction and commissioning of all allied components for Wet-well1 (Block 12A), Wet-well 2 (Block 12B), Wet well 3 (Block 7) and Wet well 4 (Block 5) with allied components as per standard specifications	54717000.00
5	Supply & Delivery, laying of pumping main including Air and Scour valves to Pumping mains 4 nos for Elamkulam Collection system	51914298.63
6	Laying of pipes under NH 66 and PWD Road by HDD method to Elamkulam STP	3881669.09
7	Laying of pipes under railway lines by HDD method to Elamkulam STP	4790839.50
8	ROAD RESTORATION CHARGES	553729025.00
9	Household Connection	259053987.43
10	Sewer cleaning and Flushing vehicles (5nos), Jet rodding machine, Manhole silt removal and Sewer Flushing, including odour control arrangements	17409278.03
11	Utility shifting works and its restoration as directed by the Department	20350000.00
12	Additional cost for SCADA, Solar system for sewer network system	15000000.00
13	Annual maintenance for sewer network , lift manhole automation , pump sets, wetwell cum pump stations and energy charges etc for 10 Years	195900000.00
14	Cost for silent generator set ,connection all allied works of lift manholes	5000000.00
Provision for GST payments (in %) @		18.0%
Amount reserved for GST payments		405508185.55
Total		2658331438.55
Lumpsum for round off		8561.45
TOTAL Rs 2658340000.00		
Rounded Total Rs 2,65,83,40,000		
Rupees Two Hundred Sixty Five Crore Eighty Three Lakh Forty Thousand Only		

(Cost Index Applied for this estimate is 35.59%)

IURWTS Project-Sewerage Scheme-Collection System Construction of Sewer network for Elamkulam STP17.5MLD including all sewer appurtenances and annual maintenance of 10 years-(FINAL)

Abstract Estimate

(Dsr year: **2018**, Cost Index Applied for this estimate is **35.59%**)

1 Supply & Delivery, laying, jointing, testing, trial run, and commissioning of sewer lines for Elamkulam Collection System		
1	15.43.2 Dismantling manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charge: Bituminous road	
Net Total Quantity		98010.471 sqm
Say 98010.471 sqm @ Rs 360.94 / sqm		Rs 35375899.40
2	od225040/2022_2023 Cutting and removal of the bituminous / concrete roads with cutting machine for a minimum depth of 200mm along the sides of proposed alignment of the pipe to be laid without causing any damage to other utilities, including the charges for hire and conveyance of tools and plant, cost of consumables and charges for lighting, watching, ribbon fencing, caution boards, traffic diversion, and as per the direction of departmental officers etc. complete, before carrying out the demolition of bituminous / concrete road by mechanical means and carrying out the excavation. Dismantling manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charge:	
Net Total Quantity		14001.506 sqm
Say 14001.506 sqm @ Rs 227.92 / sqm		Rs 3191223.25
3	16.83 Taking out existing CC interlocking paver blocks from footpath/ central verge, including removal of rubbish etc., disposal of unserviceable material to the dumping ground, for which payment shall be made separately and stacking of serviceable material within 50 metre lead as per direction of Engineer-in-Charge.	
Net Total Quantity		28003.000 sqm
Say 28003.000 sqm @ Rs 110.71 / sqm		Rs 3100212.13
4	15.2.2 Demolishing cement concrete manually / by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in-Charge. Nominal concrete 1:4:8 leaner mix (including equivalent design mix)	
Net Total Quantity		2836.727 cum
Say 2836.727 cum @ Rs 1262.82 / cum		Rs 3582275.59
5	15.3 Demolishing R.C.C. work manually / by mechanical means including stacking of steel bars and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charge.	
Net Total Quantity		39.375 cum

Say 39.375 cum @ Rs 2983.59 / cum		Rs 117478.86
6	15.9.2 Demolishing stone rubble masonry manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charges:In cement mortar	
Net Total Quantity		324.000 cum
Say 324.000 cum @ Rs 2064.97 / cum		Rs 669050.28
7	100.1.1 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : All kinds of soil (Ref. Item No. 2.10.1 of DSR)	
Net Total Quantity		180861.905 cum
Say 180861.905 cum @ Rs 555.51 / cum		Rs 100470596.85
8	100.1.2 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 1.5m but not exceeding 3 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m: 1.50m to 3.0m All kinds of soil (Ref. Item No. 2.11 of DSR)	
Net Total Quantity		60492.125 cum
Say 60492.125 cum @ Rs 661.88 / cum		Rs 40038527.70
9	100.1.3 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 3m in depth but not exceeding 4.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 3.0m to 4.50m All kinds of soil (Ref. Item No. 2.12 of DSR)	
Net Total Quantity		15560.368 cum
Say 15560.368 cum @ Rs 768.25 / cum		Rs 11954252.72

10	100.1.4 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 4.5m in depth but not exceeding 6 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 4.5m to 6.0m All kinds of soil. (Ref. Item No. 2.12 of DSR)	
Net Total Quantity		1936.507 cum
Say 1936.507 cum @ Rs 874.62 / cum		Rs 1693707.75
11	100.8.1 Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009)	
Net Total Quantity		67541.000 metre
Say 67541.000 metre @ Rs 28.01 / metre		Rs 1891823.41
12	2.16.1 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth not exceeding 1.5m	
Net Total Quantity		106713.688 sqm
Say 106713.688 sqm @ Rs 152.95 / sqm		Rs 16321858.58
13	2.16.2 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth exceeding 1.5 m but not exceeding 3 m	
Net Total Quantity		66498.298 sqm
Say 66498.298 sqm @ Rs 166.17 / sqm		Rs 11050022.18
14	2.16.3 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth exceeding 3 m but not exceeding 4.5 m	
Net Total Quantity		27393.688 sqm
Say 27393.688 sqm @ Rs 196.06 / sqm		Rs 5370806.47

15	od225062/2022_2023 Providing steel sheet shoring to the sides of the trenches to depths of above 4.00 m but not exceeding 6.00m using 6 mm M.S. sheet 0.50 M wide stiffen on edges with 50 mm x 50mm x 6 mm M.S. angles driving down vertically on either side one after another in lines and levels with suitable pile driving equipments and accessories to a maximum depth of 0.50 M below the bottom of the proposed excavation 0.5 M above ground level suitably braced by horizontal walling pieces at 75 x 150 mm x 8 mm angles on either side at intervals not exceeding 1.50M and horizontal screw jack type struts at 1.50M intervals and maintaining the shoring till the pipes are laid and works are completed, dismantling, cleaning and restacking for reuse including all labour, hire charges and conveyance for equipments, tools and plants and sundries etc. complete. (Refernce KWA approved data no.100.6.1)	
Net Total Quantity		20660.878 sqm
Say 20660.878 sqm @ Rs 776.89 / sqm		Rs 16051229.51
16	100.7.1 Bailing out water with 5 HP engine and pumpset including conveyance to the site, errection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete. NEW DATA (Prepared based on PHED SDB - Item No.1070	
Net Total Quantity		14174.000 Kwh
Say 14174.000 Kwh @ Rs 36.95 / Kwh		Rs 523729.30
17	100.7.2 Bailing out water with engine and pumpset above 5 HP upto 10 HP including conveyance to the site, errection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete. NEW DATA (Prepared based on PHED SDB - Item No.1070	
Net Total Quantity		4476.000 Kwh
Say 4476.000 Kwh @ Rs 18.44 / Kwh		Rs 82537.44
18	60.2.7 BAILING OUT WATER BY ENGAGING COOLIE - Bailing out water by engaging coolie where ever necessary where pumping with engine and pump set not possible	
Net Total Quantity		100.000 Day
Say 100.000 Day @ Rs 878.76 / Day		Rs 87876.00
19	od225063/2022_2023 Supply, Delivery and laying of 200mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2) type B. Including Laying dwc pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 200mm nominal outer dia pipes.	
Net Total Quantity		117662.300 metre

Say 117662.300 metre @ Rs 522.67 / metre		Rs 61498554.34
20	od234719/2022_2023 Supply, Delivery and laying of 250mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2) type B. Including Laying dwc pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 250mm nominal outer dia pipes.	
Net Total Quantity		5488.500 metre
Say 5488.500 metre @ Rs 838.60 / metre		Rs 4602656.10
21	od225065/2022_2023 Supply, Delivery and laying of 300mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2) type B. Including all local and central taxes, transportation freight charges, inspection charges, loading and unloading, conveyance etc. Including lowering Laying dwc pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 300mm nominal outer dia pipes.	
Net Total Quantity		946.000 metre
Say 946.000 metre @ Rs 1134.79 / metre		Rs 1073511.34
22	od234823/2022_2023 Supplying conveying and laying pipes and specials ISI marked 400mm dia HDPE pipes having PE8, PE100 including conveyance charges to stock yard, unloading charges, freight charges, taxes if any, Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing, aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe, electrofusion couplers and fittings.	
Net Total Quantity		1473.500 per metre
Say 1473.500 per metre @ Rs 8954.05 / per metre		Rs 13193792.67

23	od225069/2022_2023 Suupplying conveying and laying pipes and specials ISI marked 450mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.	
Net Total Quantity		995.000 per metre
Say 995.000 per metre @ Rs 10479.31 / per metre		Rs 10426913.45
24	od225070/2022_2023 Supplying conveying and laying pipes and specials ISI marked 500 mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.	
Net Total Quantity		842.500 per metre
Say 842.500 per metre @ Rs 14026.40 / per metre		Rs 11817242.00
25	od235029/2022_2023 Supplying conveying and laying pipes and specials ISI marked 560 mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.	
Net Total Quantity		609.000 per metre
Say 609.000 per metre @ Rs 16409.54 / per metre		Rs 9993409.86
26	od234982/2022_2023 Supplying conveying and laying pipes and specials ISI marked 630 mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe .electrofusion couplers and fittings.	

Net Total Quantity		362.000 per metre
Say 362.000 per metre @ Rs 20414.25 / per metre		Rs 7389958.50
27	7.1.1 Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with:Cement mortar 1:6 (1 cement : 6 coarse sand)	
Net Total Quantity		194.400 cum
Say 194.400 cum @ Rs 7204.78 / cum		Rs 1400609.23
28	od225083/2022_2023 Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with:Cement mortar 1:6 (1 cement : 6 coarse sand) excluding cost of rubble. Rubble can be taken from the stacked qty obtained from dismantled work	
Net Total Quantity		129.600 cum
Say 129.600 cum @ Rs 5472.39 / cum		Rs 709221.74
29	od225085/2022_2023 construction of precast drain and cover slab, including cost of, concrete, centering and shuttering, reinforcements, and all other allied activities in including all tools and plants as per the requirements of the Engineer in charge as per the drawings	
Net Total Quantity		2836.727 cum
Say 2836.727 cum @ Rs 13523.78 / cum		Rs 38363271.87
30	16.68 Providing and laying 60 mm thick factory made cement concrete interlocking paver block of M - 30 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge.	
Net Total Quantity		16801.800 sqm
Say 16801.800 sqm @ Rs 1011.57 / sqm		Rs 16996196.83
31	16.84 Laying old cement concrete interlocking paver blocks of any design/ shape laid in required line, level, curvature, colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge. (Old CC paver blocks shall be supplied by the department free of cost.)	
Net Total Quantity		11201.200 sqm
Say 11201.200 sqm @ Rs 381.62 / sqm		Rs 4274601.94

32	od225086/2022_2023 Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	
Net Total Quantity		27924.740 cum
Say 27924.740 cum @ Rs 2548.23 / cum		Rs 71158660.21
33	od225087/2022_2023 Supplying and filling in plinth with Stone dust under floors, including watering, ramming consolidating and dressing complete.	
Net Total Quantity		17329.961 cum
Say 17329.961 cum @ Rs 2102.04 / cum		Rs 36428271.22
2 Construction of RCC M30 Concrete Manholes of 1.2m and 1.5m diameter using sulphate resistant Cement and corrosion resistant steel reinforcement for Elamkulam sewer network system		
1	od238490/2022_2023 Construction of manhole of 1.2m diameter for an average depth of 1.3m (depth up to 1.5m) including, earth work in excavation by mechanical means of depth 0-1.5m including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter. R1	
Net Total Quantity		2415.000 no
Say 2415.000 no @ Rs 65945.41 / no		Rs 159258165.15
2	od238621/2022_2023 Construction of manhole of 1.2m diameter for an average depth of 1.75m (depth 1.5m to 3m) including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter. R1	

Net Total Quantity		1221.000 no
Say 1221.000 no @ Rs 77589.61 / no		Rs 94736913.81
3	od238941/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 4.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.R1	
Net Total Quantity		127.000 no
Say 127.000 no @ Rs 230765.67 / no		Rs 29307240.09
4	od238942/2022_2023 Construction of manhole of 1.2m diameter for an average depth of 2.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter.R2	
Net Total Quantity		615.000 no
Say 615.000 no @ Rs 111913.15 / no		Rs 68826587.25

5	od238980/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 3.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter. R1	
Net Total Quantity		265.000 no
Say 265.000 no @ Rs 182844.42 / no		Rs 48453771.30
6	od238931/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 3.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.R1	
Net Total Quantity		211.000 no
Say 211.000 no @ Rs 204075.70 / no		Rs 43059972.70
7	od238909/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 2.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter. R1	

Net Total Quantity		377.000 no
Say 377.000 no @ Rs 159117.03 / no		Rs 59987120.31
8	od238960/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 4.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.R1	
Net Total Quantity		59.000 no
Say 59.000 no @ Rs 253001.24 / no		Rs 14927073.16
9	od238982/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 5.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter. R2	
Net Total Quantity		18.000 no
Say 18.000 no @ Rs 274590.02 / no		Rs 4942620.36
3 Construction of RCC M30 Concrete Lift manholes of 2.5m diameter lift manholes for Elamkulam sewer network system		

1	<p>od225041/2022_2023</p> <p>Construction of manhole of 2.5m diameter for an average depth of 5.35m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.</p>	
Net Total Quantity		1.000 no
Say 1.000 no @ Rs 499112.49 / no		Rs 499112.49
2	<p>od225044/2022_2023</p> <p>Construction of manhole of 3.5m diameter for an average depth of 5m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.</p>	
Net Total Quantity		1.000 no
Say 1.000 no @ Rs 611678.75 / no		Rs 611678.75
3	<p>od225047/2022_2023</p> <p>Construction of manhole of 2.5m diameter for an average depth of 6.13m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.</p>	

Net Total Quantity		1.000 no
Say 1.000 no @ Rs 552934.17 / no		Rs 552934.17
4	od225049/2022_2023 Construction of manhole of 3m diameter for an average depth of 6.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete.	
Net Total Quantity		1.000 no
Say 1.000 no @ Rs 679364.20 / no		Rs 679364.20
5	od225051/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 4.99m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete.	
Net Total Quantity		1.000 no
Say 1.000 no @ Rs 417857.95 / no		Rs 417857.95

6	od225053/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 5.51m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.	
Net Total Quantity		1.000 no
Say 1.000 no @ Rs 510096.57 / no		Rs 510096.57
7	od225054/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 6.01m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.	
Net Total Quantity		1.000 no
Say 1.000 no @ Rs 542451.77 / no		Rs 542451.77
8	od235042/2022_2023 Providing nonclog submercible pumpset of suitable capacity (5 HP) in lift manholes/ lifting stations for lifting and conveying the sewer load to the nearest manholes including pumping main of suitable size electrical installations such as cables, switch boxes,MCC panels, isolators ,float switches etc complete necessary for functioning of lifting stations all as directed by Engineer in charge. (For Elamkulam STP)	
Net Total Quantity		1.000 each
Say 1.000 each @ Rs 455627.41 / each		Rs 455627.41
9	od235048/2022_2023 Providing nonclog submercible pumpset of suitable capacity (2 HP) in lift manholes/ lifting stations for lifting and conveying the sewer load to the nearest manholes including pumping main of suitable size electrical installations such as cables, switch boxes,MCC panels, isolators ,float switches etc complete necessary for functioning of lifting stations all as directed by Engineer in charge. (For Elamkulam STP)	

Net Total Quantity		5.000 each
Say 5.000 each @ Rs 404707.60 / each		Rs 2023538.00
10	od235058/2022_2023 Providing nonclog submercible pumpset of suitable capacity (3 HP) in lift manholes/ lifting stations for lifting and conveying the sewer load to the nearest manholes including pumping main of suitable size electrical installations such as cables, switch boxes, MCC panels, isolators ,float switches etc complete necessary for functioning of lifting stations all as directed by Engineer in charge. (For Elamkulam STP)	
Net Total Quantity		1.000 each
Say 1.000 each @ Rs 385051.23 / each		Rs 385051.23
4 Design,Supply & delivery, construction and commissioning of all allied components for Wet-well1 (Block 12A),Wet-well 2 (Block 12B), Wet well 3 (Block 7) and Wet well 4 (Block 5) with allied components as per standard specifications		
1	od238117/2022_2023 Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 1 with Screen and grit wells for Block 12A of Elamkulam Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, Construction of Control room with all facilities integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser, generator pedestal, Construction of compound wall 2.5meter height with barbed wire fencing 1.2m high , with a wicket gate along with main gate of adequate size etc complete as per specifications for highest quality standards - 1 no	
Net Total Quantity		1.000 no
Say 1.000 no @ Rs 10810000.00 / no		Rs 10810000.00
2	od238168/2022_2023 Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 2 with Screen and grit wells for Block 12B of Elamkulam Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, Construction of pump room with facilities,Control room integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser ,Construction of compound wall 2.5meter height with barbed wire fencing 1.2m high , with a wicket gate along with main gate of adequate size etc complete as per specifications for highest quality standards - 1 no	
Net Total Quantity		1.000 no
Say 1.000 no @ Rs 16083000.00 / no		Rs 16083000.00

3	od238281/2022_2023 Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 3 with Screen and grit wells for Block 7 and KWA load of Elamkulam Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, compatible capacity silent generator set meeting CPCB norms of reputed make including wiring, mounting, roofing sheets, change over switches, Construction of pump room with facilities, Control room integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser, Construction of compound wall 2.5meter height with barbed wire fencing 1.2m high , with a wicket gate along with main gate of adequate size etc complete as per specifications for highest quality standards - 1 no	
Net Total Quantity		1.000 set
Say 1.000 set @ Rs 13072000.00 / set		Rs 13072000.00
4	od238243/2022_2023 Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 4 with Screen and grit wells for Block 5 of Elamkulam Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, Construction of pump room with facilities, Control room integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser, Construction of compound wall 2.5meter height with barbed wire fencing 1.2m high , with a wicket gate along with main gate of adequate size etc complete as per specifications for highest quality standards - 1 no	
Net Total Quantity		1.000 no
Say 1.000 no @ Rs 14752000.00 / no		Rs 14752000.00
5 Supply & Delivery, laying of pumping main including Air and Scour valves to Pumping mains 4 nos for Elamkulam Collection system		
1	2.10.1.3 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil. and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m: Pipes, cables etc. exceeding 300 mm dia but not exceeding 600 mm	
Net Total Quantity		8380.000 metre
Say 8380.000 metre @ Rs 669.27 / metre		Rs 5608482.60
2	100.7.1 Bailing out water with 5 HP engine and pumpset including conveyance to the site, erection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete. NEW DATA (Prepared based on PHED SDB - Item No.1070)	

Net Total Quantity		2500.594 Kwh
Say 2500.594 Kwh @ Rs 36.95 / Kwh		Rs 92396.95
3	60.2.7 BAILING OUT WATER BY ENGAGING COOLIE - Bailing out water by engaging coolie where ever necessary where pumping with engine and pump set not possible	
Net Total Quantity		114.000 Day
Say 114.000 Day @ Rs 878.76 / Day		Rs 100178.64
4	od243527/2022_2023 Providing steel sheet shoring to the sides of the trenches upto a an average depth of 2.5 m using 6mm M.S. sheet 0.5m wide, stiffened on edges with 50mm x 50mm x 6mm MS angles driving down vertically on either side one after another in line and level with suitable pile driving equipments and accessories to a maximum depth of 0.50 M below the bottom of the proposed excavation 0.5 M above ground level suitably braced by horizontal walling pieces at 75 x 150 mm x 8 mm angles on either side at intervals not exceeding 1.50M and horizontal screw jack type struts at 1.50M intervals and maintaining the shoring till the pipes are laid and works are completed, dismantling, cleaning and restacking for reuse including all labour, hire charges and conveyance for equipments, tools and plants and sundries etc. complete.	
Net Total Quantity		5720.000 per sqm
Say 5720.000 per sqm @ Rs 407.25 / per sqm		Rs 2329470.00
5	2.16.1 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth not exceeding 1.5m	
Net Total Quantity		3173.000 sqm
Say 3173.000 sqm @ Rs 152.95 / sqm		Rs 485310.35
6	100.14.5 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 300 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.19 in DAR	
Net Total Quantity		2030.000 metre
Say 2030.000 metre @ Rs 205.15 / metre		Rs 416454.50
7	100.14.6 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 350 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.20 in DAR	
Net Total Quantity		6350.000 metre
Say 6350.000 metre @ Rs 271.79 / metre		Rs 1725866.50

8	18.30.7 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:300 mm diameter pipe	
Net Total Quantity		2.000 no
Say 2.000 no @ Rs 578.43 / no		Rs 1156.86
9	18.30.8 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:350 mm diameter pipe	
Net Total Quantity		6.000 no
Say 6.000 no @ Rs 777.41 / no		Rs 4664.46
10	18.70.5 Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and including the cost of rubber gasket:300 mm dia pipe	
Net Total Quantity		364.000 joint
Say 364.000 joint @ Rs 412.60 / joint		Rs 150186.40
11	18.70.6 Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and including the cost of rubber gasket:350 mm dia pipes	
Net Total Quantity		1156.000 joint
Say 1156.000 joint @ Rs 437.75 / joint		Rs 506039.00
12	18.83.7 Labour for cutting C.I. pipe with steel saw.300 mm diameter C.I. pipe	
Net Total Quantity		20.000 Each Cut
Say 20.000 Each Cut @ Rs 643.44 / Each Cut		Rs 12868.80
13	18.83.8 Labour for cutting C.I. pipe with steel saw.350 mm diameter C.I pipe	
Net Total Quantity		64.000 Each Cut
Say 64.000 Each Cut @ Rs 748.32 / Each Cut		Rs 47892.48
14	100.35.5 Testing 300mm DI/CI pipeline with potable water to the required test pressure. 300 mm dia Observed Data derived from item no.1023 of PHED DATA	
Net Total Quantity		2030.000 metre
Say 2030.000 metre @ Rs 55.59 / metre		Rs 112847.70

15	100.35.6 Testing 350mm DI/CI pipeline with potable water to the required test pressure. 350 mm dia Observed Data derived from item no.1024 of PHED DATA	
Net Total Quantity		6350.000 metre
Say 6350.000 metre @ Rs 67.85 / metre		Rs 430847.50
16	100.98.119 Supply of DI K9 Pipe Conforming to IS 8329/2000, 300mm Dia.	
Net Total Quantity		2030.000 metre
Say 2030.000 metre @ Rs 3537.65 / metre		Rs 7181429.50
17	100.98.120 Supply of DI K9 Pipe Conforming to IS 8329/2000, 350mm Dia.	
Net Total Quantity		6350.000 metre
Say 6350.000 metre @ Rs 4333.00 / metre		Rs 27514550.00
18	18.69.1 Providing and laying D.I Specials of Class K - 12 suitable for mechanical jointing as per IS : 9523 :Upto 600 mm dia	
Net Total Quantity		51.792 quintal
Say 51.792 quintal @ Rs 21145.26 / quintal		Rs 1095155.31
19	od238709/2022_2023 Providing, laying and fixing C.I. sluice valves (with cap) and connecting lead dwc pipe of 200mm dia to the nearest manhole considering an average distance. all complete with bolts, nuts, rubber installation etc. cost include all necessary specials, labour ,material,etc all complete. 200mm dia	
Net Total Quantity		3.000 no
Say 3.000 no @ Rs 64876.62 / no		Rs 194629.86
20	od225067/2022_2023 Supplying and fixing C.I double acting air valve of approved quality with bolts, nuts, rubber placing including cost of air valves, specials, labour, hire charges etc. complete 80 mm dia	
Net Total Quantity		8.000 no
Say 8.000 no @ Rs 7363.73 / no		Rs 58909.84
21	5.2.2 Reinforced cement concrete work in walls (any thickness), including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, piers, abutments, posts and struts etc. up tot floor five level excluding cost of centering, shuttering, finishing and reinforcement :1:1.5:3(1 cement : 1.5 coarse sand : 3 graded stone aggregate 20 mm nominal size)	
Net Total Quantity		46.401 cum
Say 46.401 cum @ Rs 10954.04 / cum		Rs 508278.41

22	od225071/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		46.401 cum
Say 46.401 cum @ Rs 1916.05 / cum		Rs 88906.64
23	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		3712.081 kilogram
Say 3712.081 kilogram @ Rs 98.30 / kilogram		Rs 364897.56
24	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
Net Total Quantity		188.574 sqm
Say 188.574 sqm @ Rs 223.32 / sqm		Rs 42112.35
25	50.2.25.1 Filling with contractor's own earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m as per direction of site Engineer-in-charge	
Net Total Quantity		1161.803 cum
Say 1161.803 cum @ Rs 525.82 / cum		Rs 610899.25
26	51.2.3 Filling with Quarry Muck Filling up low lying and water logged areas with local material/ quarry muck, spreading in layers, leveling the top at site and consolidation by ramming, etc complete for improving the CBR value of subgrade	
Net Total Quantity		1161.803 cum
Say 1161.803 cum @ Rs 902.34 / cum		Rs 1048341.32
27	od238307/2022_2023 Construction valve chamber of suitable size for air valves and Scour valves in the pumping mains including earthwork excavation by manually/mechanically, backfilling the trenches ,sandfilling for a thickness of 15cm over which levelling course 1:3:6 with 40mm aggregates RCC walls M30 grade for bottom slab and side walls, precast RCC M15 cover slab including form work and steel reinforcement, Plastering inside with cement mortar 1:3 (SRC) for 20mm thick,Plastering outside with cement mortar 1:3 (SRC) for 12mm thick,Refilling with excavated soil ,Disposal of surplus earth work,Supplying and fixing CI stepsetc complete all cost for labour materials, hire charges for tools and plants .conveyance charges etc complete 11 Nos for Elamkulam Pumping mains	
Net Total Quantity		1.000 set
Say 1.000 set @ Rs 1181525.86 / set		Rs 1181525.86
6 Laying of pipes under NH 66 and PWD Road by HDD method to Elamkulam STP		

1	od225056/2022_2023 Drilling of 600mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 500mm dia M.S casing pipe of minimum 8mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority	
Net Total Quantity		185.000 metre
Say 185.000 metre @ Rs 10646.31 / metre		Rs 1969567.35
2	od236528/2022_2023 Drilling of 1300mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 1200mm dia M.S casing pipe of minimum 8mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority.	
Net Total Quantity		45.000 metre
Say 45.000 metre @ Rs 42491.15 / metre		Rs 1912101.75
7 Laying of pipes under railway lines by HDD method to Elamkulam STP		
1	od225056/2022_2023 Drilling of 600mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 500mm dia M.S casing pipe of minimum 8mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority	
Net Total Quantity		450.000 metre
Say 450.000 metre @ Rs 10646.31 / metre		Rs 4790839.50
8 ROAD RESTORATION CHARGES		
1	od225029/2022_2023 Road Restoration Charges for BM&BC as per the directions of Engineer (PWD Road)	
Net Total Quantity		147015.706 per sqm
Say 147015.706 per sqm @ Rs 3167.05 / per sqm		Rs 465606091.69
2	od225034/2022_2023 Road Restoration Charges for CC roads as per the directions of Engineer (PWD Road)	
Net Total Quantity		21002.253 per sqm
Say 21002.253 per sqm @ Rs 4195.88 / per sqm		Rs 88122933.32
9 Household Connection		

1	od225028/2022_2023 Carrying out Household Survey for Sewerage System including all Preparatory Works, Tool Preparation, Data Collection Charges, Interviews, Data Entry, Field level monitoring, Data Verification all allied works	
Net Total Quantity		14651.000 each
Say 14651.000 each @ Rs 74.41 / each		Rs 1090180.91
2	od225035/2022_2023 Providing sewer connection to the existing households and commercial units including the cost for all supplying and laying suitable size sewer pipeline , Demolishing cement concrete manually / by mechanical means including disposal of material , Earthwork excavation and backfilling after laying works, Constructing brick masonry chamber for underground C.I. inspection chamber and bends with bricks in cement mortar 1:4 (1 cement: 4 coarse sand) C.I.cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover with frame to be not less than 38 kg (weight of cover 23kg and weight of frame 15 kg), R.C.C top slab with 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) foundation concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement: 3 coarse sand) finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete as per standard design: Inside dimensions 455x610 mm and 45 cm deep for single pipe line: With common burnt clay F.P.S. (non modular) bricks of class designation 7.5, cement concrete levelling course 1:2:4 , including KWA sewer connection fee & Documentation charge etc complete as directed by Engineer in charge	
Net Total Quantity		14651.000 no
Say 14651.000 no @ Rs 14900.62 / no		Rs 218308983.62
3	od225043/2022_2023 Suupplying conveying and laying pipes and specials ISI marked 160mm dia uPVC SN4 pipes having including conveyence charges to stock yard , unloading charges, freight charges, taxes if any, Laying UPVC pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 160 mm nominal outer dia pipes.	
Net Total Quantity		2940.000 per metre
Say 2940.000 per metre @ Rs 981.33 / per metre		Rs 2885110.20
4	od225045/2022_2023 Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.	
Net Total Quantity		71785.000 metre
Say 71785.000 metre @ Rs 512.22 / metre		Rs 36769712.70

10 Sewer cleaning and Flushing vehicles (5nos),Jet rodding machine, Manhole silt removal and Sewer Flushing, including odour control arrangements		
1	od225037/2022_2023 Purchasing LCV mounted sewer suction cum Jetting machine of 4000 liters tank capacity, Tank shell thickness of 5 mm, Jetting Pump Capacity of 100 lpm at a pressure of 150 Bar and Vacuum Pump Capacity of 5300 lpm etc with all other technical specification as specified in the NIT including transportation, Transits insurance, Entry tax, RTO registration , Temporary registration etc. complete	
Net Total Quantity		1.000 no
Say 1.000 no @ Rs 4556258.05 / no		Rs 4556258.05
2	od225039/2022_2023 Supply, testing and commissioning Hydraulic operated cum Winch Driven De-Silting Grab Bucket System inclusive of four-wheeler of Make TATA 275 /TATA ACE or Equipment Vehicle with system having traveling depth of at least 12 m, steel grab bucket of 20litres capacity, hydraulic system driven by vehicle engine. 8mm wire rope with appropriate size reel, with hydraulic cylinder, hydro motor, flexible hose, oil tank, hopper boom, hose of appropriate size etc. complete with valves, instruments, accessories with cost of vehicle etc. complete conforming with tender specifications- GWSSB SoR	
Net Total Quantity		1.000 set
Say 1.000 set @ Rs 862597.01 / set		Rs 862597.01
3	od225042/2022_2023 Supplying, testing and Commissioning Jotting machinery inclusive of Four wheeler of MAKE TATA 275/TATA ACE or Equivalent vehicle with suitable RPM Triplex Plunger Pump having minimum capacity 13 LPM and minimum pressure 200 BAR directly coupled with a separate 10 HP heavy duty, 4 stoke, air cooled diesel Engine, withwater tank having capacity 500 lit, with jetting hose of 30 m length with ID 1/4",etc. complete with hose reel, spraying hose and gun, valves, instruments, accessories with cost of vehicles etc. complete conforming with tender specifications.	
Net Total Quantity		1.000 set
Say 1.000 set @ Rs 890422.98 / set		Rs 890422.98
4	od225046/2022_2023 Providing operationg Non-Motorised Manhole cleaner: Manual Grab to scrap and collect solids from manholes with Collection bucket of not less than 6 litres having extension rod of minimum 2 m adjustable upto 3m with all allied accessories conforming to standard specifications	
Net Total Quantity		5.000 set
Say 5.000 set @ Rs 20000.00 / set		Rs 100000.00

5	od225048/2022_2023 Vehicle Mounted High Pressure Jetting cum Sewer Suction Machine mounted on a vehicle of 16 T GVW Chasis with small wheel base and suitable for cleaning the Sewer Line in the lanes and by lanes in the City with tank capacity of minimum 7000 Litres having clean water and sludge collection tank capable of efficiently working in sewer lines of diameters ranging from 200-600 mm, suitable for dislodging and removing obstruction and blockages from Sewer line by High Pressure Water Jetting System with requisite pressure take off and suctioning the sludge/slurry from sewers/ manholes through suitably dimensioned jetting hoses and nozzles aspirating the dislodged effluent and treating it in the filtration unit for recycling the liquid filtered/cleaned in multiple stages and is used for jetting purposes and transporting only the sludge to any desired disposal site for emptying the collected sludge under gravity in the tipping site with ease of cleaning, clearing and maintenance with dignity compliant to MS Act,2013, Noise & safety standards etc with all statutory norms/clearances applicable including MV Act provisions etc complete.	
Net Total Quantity		1.000 set
Say 1.000 set @ Rs 5999999.99 / set		Rs 5999999.99
6	od242912/2022_2023 Vehicle Mounted High Pressure Jetting cum Sewer Suction Machine chassis mounted on a vehicle of 9 T GVW having clean water and sludge collection tank of minimum 7000 l capacity capable of efficiently working in sewer lines of diameters ranging from 200-600 mm, suitable for dislodging and removing obstruction and blockages from Sewer line by High Pressure Water Jetting System with requisite pressure take off and suctioning the sludge/slurry from sewers/ manholes through suitably dimensioned jetting hoses and nozzles aspirating the dislodged effluent and transporting the same to any desired disposal site for emptying the collected sludge under gravity in the tipping site with ease of maintenance and dignity in cleaning, clearing in compliance with to Manual Scavenging Act,2013, applicable Noise Pollution (Regulation and Control) Rules 2000, safety standards statutory norms/clearances/and MV Act,2019 provisions including Advanced Odour Control arrangements (2 nos) including suction hoses, hydraulic system, control units, valves and accessories as per sturdy standards and specifications and commissioning etc complete	
Net Total Quantity		1.000 set
Say 1.000 set @ Rs 5000000.00 / set		Rs 5000000.00
11 Utility shifting works and its restoration as directed by the Department		
Lump-Sum Total		Rs 20350000.00
12 Additional cost for SCADA, Solar system for sewer network system		
Lump-Sum Total		Rs 15000000.00
13 Annual maintenance for sewer network , lift manhole automation , pump sets, wetwell cum pump stations and energy charges etc for 10 Years		
Lump-Sum Total		Rs 195900000.00
14 Cost for silent generator set ,connection all allied works of lift manholes		
Lump-Sum Total		Rs 5000000.00
Provision for GST payments (in %) @		18.0%

Amount reserved for GST payments	405508185.55
Total	2658331438.55
Lumpsum for round off	8561.45
TOTAL Rs 2658340000.00	
Rounded Total Rs 2,65,83,40,000	
Rupees Two Hundred Sixty Five Crore Eighty Three Lakh Forty Thousand Only	

(Cost Index Applied for this estimate is 35.59%)



Other Engineering Organisations

PRICE

IURWTS Project-Sewerage Scheme-Collection System Construction of Sewer network for Elamkulam STP17.5MLD including all sewer appurtenances and annual maintenance of 10 years-(FINAL)

Detailed Estimate

(Dsr year: **2018**, Cost Index Applied for this estimate is **35.59%**)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
1 Supply & Delivery, laying, jointing, testing, trial run, and commissioning of sewer lines for Elamkulam Collection System								
1	15.43.2 Dismantling manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charge:Bituminous road							
	(0m to 1.5m)70% of sewer lines Tar roads							
	200mm dia pipe	1	60668.626	0.750		0.7	31851.029	
	250mm dia pipe	1	265.925	0.750		0.7	139.611	
	300mm	1	41.000	0.750		0.7	21.525	
	0 to 3m (70% of sewer lines Tar roads)							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	54346.631	1.350		0.7	51357.567	
	250mm dia pipe	1	1266.289	1.350		0.7	1196.644	
	300mm dia pipe	1	77.000	1.350		0.7	72.765	
	400mm dia pipe	1	992.862	1.500		0.7	1042.506	
	450mm dia pipe	1	94.000	1.600		0.7	105.280	
	0 to 4.5m70% of sewer lines Tar roads							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	8384.1991	0.950		0.7	5575.493	
	250mm dia pipe	1	3934.016	0.950		0.7	2616.121	
	300mm dia	1	894.488	0.950		0.7	594.835	
	400mm dia pipe	1	581.000	1.100		0.7	447.370	
	450mm	1	678.000	1.200		0.7	569.520	
	500mm	1	751.000	1.250		0.7	657.125	
	560mm	1	157.000	1.300		0.7	142.870	
	Above 4.5m)70% of sewer lines Tar roads							
	depth of cutting upto 1.5m,200mm dia pipe	1	285.992	0.950		0.7	190.185	
	250mm dia pipe	1	351.203	0.950		0.7	233.550	
	450mm dia pipe	1	280.000	1.200		0.7	235.200	

	500mm dia	1	159.000	1.250		0.7	139.125	
	560mm dia	1	491.000	1.300		0.7	446.810	
	630mm dia	1	383.000	1.400		0.7	375.340	
	Total Quantity						98010.471 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						98010.471 sqm	
	Say 98010.471 sqm @ Rs 360.94 / sqm						Rs 35375899.40	
2	od225040/2022_2023 Cutting and removal of the bituminous / concrete roads with cutting machine for a minimum depth of 200mm along the sides of proposed alignment of the pipe to be laid without causing any damage to other utilities, including the charges for hire and conveyance of tools and plant, cost of consumables and charges for lighting, watching, ribbon fencing, caution boards, traffice diversion, and as per the direction of departmental officers etc. complete, before carrying out the demolition of bituminous / concrete road by mechanical means and carrying out the excavation. Dismantling manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charge:							
	(0m to 1.5m)10% of sewer lines roads							
	200mm dia pipe	1	60668.626	0.750		0.1	4550.147	
	250mm dia pipe	1	265.925	0.750		0.1	19.945	
	300mm	1	41.000	0.750		0.1	3.075	
	0 to 3m (10% of sewer lines roads)							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	54346.631	1.350		0.1	7336.796	
	250mm dia pipe	1	1266.289	1.350		0.1	170.950	
	300mm dia pipe	1	77.000	1.350		0.1	10.396	
	400mm dia pipe	1	992.862	1.500		0.1	148.930	
	450mm dia pipe	1	94.000	1.600		0.1	15.041	
	0 to 4.5m10% of sewer lines Tar roads							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	8384.1991	0.950		0.1	796.499	
	250mm dia pipe	1	3934.016	0.950		0.1	373.732	
	300mm dia	1	894.488	0.950		0.1	84.977	
	400mm dia pipe	1	581.000	1.100		0.1	63.911	
	450mm	1	678.000	1.200		0.1	81.361	
	500mm	1	751.000	1.250		0.1	93.875	
	560mm	1	157.000	1.300		0.1	20.410	

	Above 4.5m)10% of sewer lines Tar roads						
	depth of cutting upto 1.5m,200mm dia pipe	1	285.992	0.950		0.1	27.170
	250mm dia pipe	1	351.203	0.950		0.1	33.365
	450mm dia pipe	1	280.000	1.200		0.1	33.600
	500mm dia	1	159.000	1.250		0.1	19.875
	560mm dia	1	491.000	1.300		0.1	63.831
	630mm dia	1	383.000	1.400		0.1	53.620
	Total Quantity						14001.506 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						14001.506 sqm
	Say 14001.506 sqm @ Rs 227.92 / sqm						Rs 3191223.25
3	16.83 Taking out existing CC interlocking paver blocks from footpath/ central verge, including removal of rubbish etc., disposal of unserviceable material to the dumping ground, for which payment shall be made separately and stacking of serviceable material within 50 metre lead as per direction of Engineer-in-Charge.						
	(0m to 1.5m)20% of sewer lines						
	200mm dia pipe	1	60668.626	0.750		0.2	9100.294
	250mm dia pipe	1	265.925	0.750		0.2	39.889
	300mm	1	41.000	0.750		0.2	6.150
	0 to 3m (20% of sewer lines roads)						
	Depth of cutting upto 1.5m, 200mm dia pipe	1	54346.631	1.350		0.2	14673.591
	250mm dia pipe	1	1266.289	1.350		0.2	341.899
	300mm dia pipe	1	77.000	1.350		0.2	20.791
	400mm dia pipe	1	992.862	1.500		0.2	297.859
	450mm dia pipe	1	94.000	1.600		0.2	30.081
	0 to 4.5m20% of sewer lines Tar roads						
	Depth of cutting upto 1.5m, 200mm dia pipe	1	8384.1991	0.950		0.2	1592.998
	250mm dia pipe	1	3934.016	0.950		0.2	747.464
	300mm dia	1	894.488	0.950		0.2	169.953
	400mm dia pipe	1	581.000	1.100		0.2	127.821
	450mm	1	678.000	1.200		0.2	162.721

	500mm	1	751.000	1.250		0.2	187.750	
	560mm	1	157.000	1.300		0.2	40.820	
	Above 4.5m)20% of sewer lines Tar roads							
	depth of cutting upto 1.5m,200mm dia pipe	1	285.992	0.950		0.2	54.339	
	250mm dia pipe	1	351.203	0.950		0.2	66.729	
	450mm dia pipe	1	280.000	1.200		0.2	67.200	
	500mm dia	1	159.000	1.250		0.2	39.750	
	560mm dia	1	491.000	1.300		0.2	127.661	
	630mm dia	1	383.000	1.400		0.2	107.240	
	Total Quantity						28003.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						28003.000 sqm	
	Say 28003.000 sqm @ Rs 110.71 / sqm						Rs 3100212.13	
4	15.2.2 Demolishing cement concrete manually / by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in-Charge.Nominal concrete 1:4:8 leaner mix (including equivalent design mix)							
	For drains and culverts	1	6754.11155	0.700*4	0.150		2836.727	5% of total Road length for drains and culverts
	Total Quantity						2836.727 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2836.727 cum	
	Say 2836.727 cum @ Rs 1262.82 / cum						Rs 3582275.59	
5	15.3 Demolishing R.C.C. work manually / by mechanical means including stacking of steel bars and disposal of unserviceable material with in 50 metres lead as per direction of Engineer -in-Charge.							
	For RCC structures	15	3.500	0.500	1.500		39.375	
	Total Quantity						39.375 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						39.375 cum	
	Say 39.375 cum @ Rs 2983.59 / cum						Rs 117478.86	
6	15.9.2							

	Demolishing stone rubble masonry manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charges:In cement mortar							
	For RR structures	1	600.000	0.450	1.200		324.000	
	Total Quantity						324.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						324.000 cum	
	Say 324.000 cum @ Rs 2064.97 / cum						Rs 669050.28	
7	100.1.1 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : All kinds of soil (Ref. Item No. 2.10.1 of DSR)							
	(0m to 1.5m)							
	200mm dia pipe	1	60668.626	0.750	1.200		54601.764	
	250mm dia pipe	1	265.925	0.750	1.200		239.333	
	300mm	1	41.000	0.750	1.200		36.900	
	0 to 3m							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	54346.631	1.350	1.500		110051.928	
	250mm dia pipe	1	1266.289	1.350	1.500		2564.236	
	300mm dia pipe	1	77.000	1.350	1.500		155.925	
	400mm dia pipe	1	992.862	1.500	1.500		2233.940	
	450mm dia pipe	1	94.000	1.600	1.500		225.601	
	0 to 4.5m							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	8384.1991	0.950	1.500		11947.484	
	250mm dia pipe	1	3934.016	0.950	1.500		5605.973	
	300mm dia	1	894.488	0.950	1.500		1274.646	
	400mm dia pipe	1	581.000	1.100	1.500		958.651	
	450mm	1	678.000	1.200	1.500		1220.400	
	500mm	1	751.000	1.250	1.500		1408.125	
	560mm	1	157.000	1.300	1.500		306.150	

	Above 4.5m)						
	depth of cutting upto 1.5m, 200mm dia pipe	1	285.992	0.950	1.500		407.539
	250mm dia pipe	1	351.203	0.950	1.500		500.465
	450mm dia pipe	1	280.000	1.200	1.500		504.000
	500mm dia	1	159.000	1.250	1.500		298.125
	560mm dia	1	491.000	1.300	1.500		957.450
	630mm dia	1	383.000	1.400	1.500		804.300
	Deduction for Manholes						
	1.2m dia Manhole	4251	1.200+.5	1.100	1.500		- 11924.055
	1.5m dia manhole	1057	1.500+.5	1.100	1.500		-3488.100
	LS 2m dia	7	2.000+.5	1.100	1.500		-28.875
	Total Quantity						196302.935 cum
	Total Deducted Quantity						-15441.030 cum
	Net Total Quantity						180861.905 cum
	Say 180861.905 cum @ Rs 555.51 / cum						Rs 100470596.85
8	100.1.2 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 1.5m but not exceeding 3 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m: 1.50m to 3.0m All kinds of soil (Ref. Item No. 2.11 of DSR)						
	0 to 3m						
	Depth of cutting upto 1.5m, 200mm dia pipe	1	54346.631	0.750	0.950		38721.975
	250mm dia pipe	1	1266.289	0.750	0.950		902.231
	300mm dia pipe	1	77.000	0.750	0.950		54.863
	400mm dia pipe	1	992.862	0.900	0.950		848.898
	450mm dia pipe	1	94.000	1.000	0.950		89.300
	0 to 4.5m						
	Depth of cutting upto 1.5m, 200mm dia pipe	1	8384.1991	0.950	1.500		11947.484
	250mm dia pipe	1	3934.016	0.950	1.500		5605.973

	300mm dia	1	894.488	0.950	1.500		1274.646	
	400mm dia pipe	1	581.000	1.100	1.500		958.651	
	450mm	1	678.000	1.200	1.500		1220.400	
	500mm	1	751.000	1.250	1.500		1408.125	
	560mm	1	157.000	1.300	1.500		306.150	
	Above 4.5m)							
	depth of cutting upto 1.5m, 200mm dia pipe	1	285.992	0.950	1.500		407.539	
	250mm dia pipe	1	351.203	0.950	1.500		500.465	
	450mm dia pipe	1	280.000	1.200	1.500		504.000	
	500mm dia	1	159.000	1.250	1.500		298.125	
	560mm dia	1	491.000	1.300	1.500		957.450	
	630mm dia	1	383.000	1.400	1.500		804.300	
	Deduction for Manholes							
	1.2m dia	1836	1.200+.5	1.000	1.000		-3121.200	
	1.5m dia manhole	1057	1.500+.5	1.000	1.500		-3171.000	
	LS 2m dia upto 3 m	7	2.000+.5	1.000	1.500		-26.250	
	Total Quantity						66810.575 cum	
	Total Deducted Quantity						-6318.450 cum	
	Net Total Quantity						60492.125 cum	
	Say 60492.125 cum @ Rs 661.88 / cum						Rs 40038527.70	
9	100.1.3 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 3m in depth but not exceeding 4.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 3.0m to 4.50m All kinds of soil (Ref. Item No. 2.12 of DSR)							
	0 to 4.5m							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	8384.1991	0.950	0.950		7566.740	
	250mm dia pipe	1	3934.016	0.950	0.950		3550.450	
	300mm dia	1	894.488	0.950	0.950		807.276	
	400mm dia pipe	1	581.000	1.100	0.950		607.145	

	450mm	1	678.000	1.200	0.950		772.920	
	500mm	1	751.000	1.250	0.950		891.813	
	560mm	1	157.000	1.300	0.950		193.895	
	Above 4.5m)							
	depth of cutting upto 1.5m,200mm dia pipe	1	285.992	0.950	1.500		407.539	
	250mm dia pipe	1	351.203	0.950	1.500		500.465	
	450mm dia pipe	1	280.000	1.200	1.500		504.000	
	500mm dia	1	159.000	1.250	1.500		298.125	
	560mm dia	1	491.000	1.300	1.500		957.450	
	630mm dia	1	383.000	1.400	1.500		804.300	
	Deduction for Manholes							
	1.5m dia manhole	680	1.500+.5	1.100	1.500		-2244.000	
	LS 2m dia	14	2.000+.5	1.100	1.500		-57.750	
	Total Quantity						17862.118 cum	
	Total Deducted Quantity						-2301.750 cum	
	Net Total Quantity						15560.368 cum	
	Say 15560.368 cum @ Rs 768.25 / cum						Rs 11954252.72	
10	100.1.4 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 4.5m in depth but not exceeding 6 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 4.5m to 6.0m All kinds of soil. (Ref. Item No. 2.12 of DSR)							
	Above 4.5m)							
	depth of cutting upto 1.5m,200mm dia pipe	1	285.992	0.950	0.950		258.108	
	250mm dia pipe	1	351.203	0.950	0.950		316.961	
	450mm dia pipe	1	280.000	1.200	0.950		319.200	
	500mm dia	1	159.000	1.250	0.950		188.813	
	560mm dia	1	491.000	1.300	0.950		606.385	
	630mm dia	1	383.000	1.400	0.950		509.390	
	Deduction for Manholes							

	1.5m dia manhole	77	1.500+.5	1.100	1.500		-254.100	
	LS 2m dia	2	2.000+.5	1.100	1.500		-8.250	
	Total Quantity						2198.857 cum	
	Total Deducted Quantity						-262.350 cum	
	Net Total Quantity						1936.507 cum	
	Say 1936.507 cum @ Rs 874.62 / cum						Rs 1693707.75	
11	100.8.1 Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009)							
	50% of Sewer lines	1	135082.00 0			0.5	67541.000	
	Total Quantity						67541.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						67541.000 metre	
	Say 67541.000 metre @ Rs 28.01 / metre						Rs 1891823.41	
12	2.16.1 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth not exceeding 1.5m (0m to 1.5m)(20% considered)							
	200mm dia pipe	2	60668.626		1.200	0.2	29120.941	
	250mm dia pipe	2	265.925		1.200	0.2	127.644	
	300mm	2	41.000		1.200	0.2	19.680	
	0 to 3m (20% considered)							
	Depth of cutting upto 1.5m, 200mm dia pipe	2	54346.631		1.500	0.2	32607.979	
	250mm dia pipe	2	1266.289		1.500	0.2	759.774	
	300mm dia pipe	2	77.000		1.500	0.2	46.200	
	400mm dia pipe	2	992.862		1.500	0.2	595.718	
	450mm dia pipe	2	94.000		1.500	0.2	56.401	
	0 to 4.5m(100% considered)							
	Depth of cutting upto 1.5m, 200mm dia pipe	2	8384.1991		1.500		25152.598	
	250mm dia pipe	2	3934.016		1.500		11802.048	
	300mm dia	2	894.488		1.500		2683.464	

	400mm dia pipe	2	581.000		1.500		1743.000	
	450mm	2	678.000		1.500		2034.000	
	500mm	2	751.000		1.500		2253.000	
	560mm	2	157.000		1.500		471.000	
	Deduction for Manholes (20% is considered)							
	1.2m dia Manhole	4251	1.200+.5		1.500	0.2	-2168.009	
	1.5m dia manhole	980	1.500+.5		1.500	0.2	-588.000	
	LS 2m dia upto 3 m	5	2+.5		1.500	0.2	-3.750	
	Total Quantity						109473.447 sqm	
	Total Deducted Quantity						-2759.759 sqm	
	Net Total Quantity						106713.688 sqm	
	Say 106713.688 sqm @ Rs 152.95 / sqm						Rs 16321858.58	
13	2.16.2 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth exceeding 1.5 m but not exceeding 3 m							
	0 to 3m (20% considered)							
	Depth of cutting upto 1.5m, 200mm dia pipe	2	54346.631		0.950	0.2	20651.720	
	250mm dia pipe	2	1266.289		0.950	0.2	481.190	
	300mm dia pipe	2	77.000		0.950	0.2	29.260	
	400mm dia pipe	2	992.862		0.950	0.2	377.288	
	450mm dia pipe	2	94.000		0.950	0.2	35.720	
	0 to 4.5m(100% considered)							
	Depth of cutting upto 1.5m, 200mm dia pipe	2	8384.1991		1.500		25152.598	
	250mm dia pipe	2	3934.016		1.500		11802.048	
	300mm dia	2	894.488		1.500		2683.464	
	400mm dia pipe	2	581.000		1.500		1743.000	
	450mm	2	678.000		1.500		2034.000	
	500mm	2	751.000		1.500		2253.000	
	560mm	2	157.000		1.500		471.000	
	Deduction for Manholes							
	1.2m dia Manhole	1836	1.200+.5		1.000	0.2	-624.240	
	1.5m dia manhole	980	1.500+.5		1.500	0.2	-588.000	

	LS 2m dia	5	2.000+.5		1.500	0.2	-3.750	
	Total Quantity						67714.288 sqm	
	Total Deducted Quantity						-1215.990 sqm	
	Net Total Quantity						66498.298 sqm	
	Say 66498.298 sqm @ Rs 166.17 / sqm						Rs 11050022.18	
14	2.16.3 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth exceeding 3 m but not exceeding 4.5 m							
	0 to 4.5m(100% considered)							
	Depth of cutting upto 1.5m, 200mm dia pipe	2	8384.1991		0.950		15929.979	
	250mm dia pipe	2	3934.016		0.950		7474.631	
	300mm dia	2	894.488		0.950		1699.528	
	400mm dia pipe	2	581.000		0.950		1103.900	
	450mm	2	678.000		0.950		1288.200	
	500mm	2	751.000		0.950		1426.900	
	560mm	2	157.000		0.950		298.300	
	Deduction for Manhole							
	1.5 m dia	603	1.5+.5		1.500		-1809.000	
	LS-2m dia 3 to 4.5 m	5	2+.5		1.500		-18.750	
	Total Quantity						29221.438 sqm	
	Total Deducted Quantity						-1827.750 sqm	
	Net Total Quantity						27393.688 sqm	
	Say 27393.688 sqm @ Rs 196.06 / sqm						Rs 5370806.47	
15	od225062/2022_2023 Providing steel sheet shoring to the sides of the trenches to depths of above 4.00 m but not exceeding 6.00m using 6 mm M.S. sheet 0.50 M wide stiffen on edges with 50 mm x 50mm x 6 mm M.S. angles driving down vertically on either side one after another in lines and levels with suitable pile driving equipments and accessories to a maximum depth of 0.50 M below the bottom of the proposed excavation 0.5 M above ground level suitably braced by horizontal walling pieces at 75 x 150 mm x 8 mm angles on either side at intervals not exceeding 1.50M and horizontal screw jack type struts at 1.50M intervals and maintaining the shoring till the pipes are laid and works are completed, dismantling, cleaning and restacking for reuse including all labour, hire charges and conveyance for equipments, tools and plants and sundries etc. complete. (Refernce KWA approved data no.100.6.1)							
	Above 4.5m)							
	depth of cutting upto 1.5m,200mm dia pipe	2	285.992		5.450		3117.313	

	250mm dia pipe	2	351.203		5.450		3828.113	
	450mm dia pipe	2	280.000		5.450		3052.000	
	500mm dia	2	159.000		5.450		1733.101	
	560mm dia	2	491.000		5.450		5351.901	
	630mm dia	2	383.000		5.450		4174.700	
	Deduction for Manholes							
	1.5m dia manhole	77	1.500+.5		3.750		-577.500	
	LS 2m dia upto 3 m	2	2.000+.5		3.750		-18.750	
	Total Quantity						21257.128 sqm	
	Total Deducted Quantity						-596.250 sqm	
	Net Total Quantity						20660.878 sqm	
	Say 20660.878 sqm @ Rs 776.89 / sqm						Rs 16051229.51	
16	100.7.1 Bailing out water with 5 HP engine and pumpset including conveyance to the site, erection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete. NEW DATA (Prepared based on PHED SDB - Item No.1070)							
		3800		5.000	0.746		14174.000	3800hours
	Total Quantity						14174.000 Kwh	
	Total Deducted Quantity						0.000 Kwh	
	Net Total Quantity						14174.000 Kwh	
	Say 14174.000 Kwh @ Rs 36.95 / Kwh						Rs 523729.30	
17	100.7.2 Bailing out water with engine and pumpset above 5 HP upto 10 HP including conveyance to the site, erection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete. NEW DATA (Prepared based on PHED SDB - Item No.1070)							
		600	10.000		0.746		4476.000	
	Total Quantity						4476.000 Kwh	
	Total Deducted Quantity						0.000 Kwh	
	Net Total Quantity						4476.000 Kwh	
	Say 4476.000 Kwh @ Rs 18.44 / Kwh						Rs 82537.44	
18	60.2.7 BAILING OUT WATER BY ENGAGING COOLIE - Bailing out water by engaging coolie where ever necessary where pumping with engine and pump set not possible							
		100					100.000	

	Total Quantity						100.000 Day
	Total Deducted Quantity						0.000 Day
	Net Total Quantity						100.000 Day
	Say 100.000 Day @ Rs 878.76 / Day						Rs 87876.00
19	od225063/2022_2023 Supply, Delivery and laying of 200mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2) type B. Including Laying dwc pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 200mm nominal outer dia pipes.						
		1	123685.00 0				123685.00 0
	Deduction for manhole						
	1.2m dia manhole	4251	1.200				-5101.200
	1.5 dia manhole	605	1.500				-907.500
	LS	7	2.000				-14.000
	Total Quantity						123685.000 metre
	Total Deducted Quantity						-6022.700 metre
	Net Total Quantity						117662.300 metre
	Say 117662.300 metre @ Rs 522.67 / metre						Rs 61498554.34
20	od234719/2022_2023 Supply, Delivery and laying of 250mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2) type B. Including Laying dwc pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 250mm nominal outer dia pipes.						
		1	5817.000				5817.000
	Deduction for manhole						
	1.5 dia manhole	219	1.500				-328.500
	Total Quantity						5817.000 metre
	Total Deducted Quantity						-328.500 metre
	Net Total Quantity						5488.500 metre

	Say 5488.500 metre @ Rs 838.60 / metre						Rs 4602656.10	
21	od225065/2022_2023 Supply, Delivery and laying of 300mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2) type B. Including all local and central taxes, transportation freight charges, inspection charges, loading and unloading, conveyance etc. Including lowering Laying dwc pipes and specials, lowering to the trenches already made , placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 300mm nominal outer dia pipes.							
		1	1012.000				1012.000	
	Deduction for manhole							
	1.5 dia manhole	44	1.500				-66.000	
	Total Quantity						1012.000 metre	
	Total Deducted Quantity						-66.000 metre	
	Net Total Quantity						946.000 metre	
	Say 946.000 metre @ Rs 1134.79 / metre						Rs 1073511.34	
22	od234823/2022_2023 Supplying conveying and laying pipes and specials ISI marked 400mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrylic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.							
		1	1574.000				1574.000	
	Deduction for manhole							
	1.5 dia manhole	67	1.500				-100.500	
	Total Quantity						1574.000 per metre	
	Total Deducted Quantity						-100.500 per metre	
	Net Total Quantity						1473.500 per metre	
	Say 1473.500 per metre @ Rs 8954.05 / per metre						Rs 13193792.67	
23	od225069/2022_2023 Suupplying conveying and laying pipes and specials ISI marked 450mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line							

	thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.						
		1	1052.000				1052.000
	Deduction for manhole						
	1.5 dia manhole	38	1.500				-57.000
	Total Quantity						1052.000 per metre
	Total Deducted Quantity						-57.000 per metre
	Net Total Quantity						995.000 per metre
	Say 995.000 per metre @ Rs 10479.31 / per metre						Rs 10426913.45
24	od225070/2022_2023 Supplying conveying and laying pipes and specials ISI marked 500 mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.						
		1	910.000				910.000
	Deduction for manhole						
	1.5 dia manhole	45	1.500				-67.500
	Total Quantity						910.000 per metre
	Total Deducted Quantity						-67.500 per metre
	Net Total Quantity						842.500 per metre
	Say 842.500 per metre @ Rs 14026.40 / per metre						Rs 11817242.00
25	od235029/2022_2023 Supplying conveying and laying pipes and specials ISI marked 560 mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.						
		1	648.000				648.000
	Deduction for manhole						

	1.5 dia manhole	26	1.500				-39.000	
	Total Quantity						648.000 per metre	
	Total Deducted Quantity						-39.000 per metre	
	Net Total Quantity						609.000 per metre	
	Say 609.000 per metre @ Rs 16409.54 / per metre						Rs 9993409.86	
26	od234982/2022_2023 Supplying conveying and laying pipes and specials ISI marked 630 mm dia HDPE pipes having PE8, PE100 including conveyance charges to stock yard , unloading charges, freight charges, taxes if any, Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.							
		1	383.000				383.000	
	Deduction for manhole							
	1.5 dia manhole	14	1.500				-21.000	
	Total Quantity						383.000 per metre	
	Total Deducted Quantity						-21.000 per metre	
	Net Total Quantity						362.000 per metre	
	Say 362.000 per metre @ Rs 20414.25 / per metre						Rs 7389958.50	
27	7.1.1 Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with: Cement mortar 1:6 (1 cement : 6 coarse sand)							
		1	600.000	0.450	1.200	0.6	194.400	
	Total Quantity						194.400 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						194.400 cum	
	Say 194.400 cum @ Rs 7204.78 / cum						Rs 1400609.23	
28	od225083/2022_2023 Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with: Cement mortar 1:6 (1 cement : 6 coarse sand) excluding cost of rubble. Rubble can be taken from the stacked qty obtained from dismantled work							
		1	600.000	0.450	1.200	0.4	129.600	
	Total Quantity						129.600 cum	

	Total Deducted Quantity							0.000 cum
	Net Total Quantity							129.600 cum
	Say 129.600 cum @ Rs 5472.39 / cum							Rs 709221.74
29	od225085/2022_2023 construction of precast drain and cover slab, including cost of, concrete, centering and shuttering, reinforcements, and all other allied activities in including all tools and plants as per the requirements of the Engineer in charge as per the drawings							
	for drains and culverts	1	6754.1115 55	0.700*4	0.150		2836.727	5% of total road length for drains and culverts
	Total Quantity							2836.727 cum
	Total Deducted Quantity							0.000 cum
	Net Total Quantity							2836.727 cum
	Say 2836.727 cum @ Rs 13523.78 / cum							Rs 38363271.87
30	16.68 Providing and laying 60 mm thick factory made cement concrete interlocking paver block of M - 30 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge.							
	60% considered	1	28003.000			0.6	16801.800	
	Total Quantity							16801.800 sqm
	Total Deducted Quantity							0.000 sqm
	Net Total Quantity							16801.800 sqm
	Say 16801.800 sqm @ Rs 1011.57 / sqm							Rs 16996196.83
31	16.84 Laying old cement concrete interlocking paver blocks of any design/ shape laid in required line, level, curvature, colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge. (Old CC paver blocks shall be supplied by the department free of cost.)							
	40% considered	1	28003.000			0.4	11201.200	
	Total Quantity							11201.200 sqm
	Total Deducted Quantity							0.000 sqm
	Net Total Quantity							11201.200 sqm
	Say 11201.200 sqm @ Rs 381.62 / sqm							Rs 4274601.94
32	od225086/2022_2023 Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in							

	desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge							
	Quantity of Bedding /Embedment upto spring line of pipe							
	200mm	1	115015.00 0	0.750	0.300		25878.375	
	250mm	1	1532.000	0.750	0.325		373.425	
	300mm	1	118.000	0.750	0.350		30.975	
	400mm	1	993.000	0.900	0.400		357.480	
	450mm	1	94.000	1.000	0.425		39.950	
	200mm	1	8670.000	0.950	0.300		2470.950	
	250mm	1	4285.000	0.950	0.325		1322.994	
	300mm	1	894.000	0.950	0.350		297.255	
	400mm	1	581.000	1.100	0.400		255.641	
	450mm	1	958.000	1.200	0.425		488.580	
	500mm	1	910.000	1.250	0.450		511.875	
	560mm	1	648.000	1.300	0.480		404.352	
	630mm dia	1	383.000	1.400	0.515		276.143	
	Other Engineering Organisations							
	Deduction							
	200mm	123685	0.3925	0.200	0.200		-1941.854	
	250mm	5817	0.3925	0.250	0.250		-142.698	
	300mm	1012	0.3925	0.300	0.300		-35.748	
	400mm	1574	0.3925	0.400	0.400		-98.847	
	450mm	1052	0.3925	0.450	0.450		-83.614	
	500mm	910	0.3925	0.500	0.500		-89.293	
	560mm	648	0.3925	0.560	0.560		-79.761	
	630mm	383	0.3925	0.630	0.630		-59.664	
	deduction for Manhole							
		20	2.000	1.100	0.300		-13.200	
		38	2.000	1.200	0.300		-27.360	
		36	2.000	1.250	0.300		-27.000	
		25	2.000	1.300	0.300		-19.500	
		15	2.000	1.400	0.300		-12.600	
		923	2.000	0.950	0.300		-526.109	

		4251	1.700	0.750	0.300		-1626.007	
	Total Quantity						32707.995 cum	
	Total Deducted Quantity						-4783.255 cum	
	Net Total Quantity						27924.740 cum	
	Say 27924.740 cum @ Rs 2548.23 / cum						Rs 71158660.21	
33	od225087/2022_2023 Supplying and filling in plinth with Stone dust under floors, including watering, ramming consolidating and dressing complete.							
	Embedment from spring line till 100 mm above the top of pipe							
	200mm	1	115015.000	0.750	0.200		17252.250	
	250mm	1	1532.000	0.750	0.225		258.526	
	300mm	1	118.000	0.750	0.250		22.125	
	400mm	1	993.000	0.900	0.300		268.110	
	450mm	1	94.000	1.000	0.325		30.550	
	200mm	1	8670.000	0.950	0.200		1647.301	
	250mm	1	4285.000	0.950	0.225		915.919	
	300mm	1	894.000	0.950	0.250		212.325	
	400mm	1	581.000	1.100	0.300		191.730	
	450mm	1	958.000	1.200	0.325		373.620	
	500mm	1	910.000	1.250	0.350		398.125	
	560mm	1	648.000	1.300	0.380		320.112	
	630mm dia	1	383.000	1.400	0.415		222.523	
	Deduction							
	200mm	123685	0.3925	0.200	0.200		-1941.854	
	250mm	5817	0.3925	0.250	0.250		-142.698	
	300mm	1012	0.3925	0.300	0.300		-35.748	
	400mm	1574	0.3925	0.400	0.400		-98.847	
	450mm	1052	0.3925	0.450	0.450		-83.614	
	500mm	910	0.3925	0.500	0.500		-89.293	
	560mm	648	0.3925	0.560	0.560		-79.761	
	630mm	383	0.3925	0.630	0.630		-59.664	
	deduction for Manhole							
		20	2.000	1.100	0.300		-13.200	

		38	2.000	1.200	0.300		-27.360	
		36	2.000	1.250	0.300		-27.000	
		25	2.000	1.300	0.300		-19.500	
		15	2.000	1.400	0.300		-12.600	
		923	2.000	0.950	0.300		-526.109	
		4251	1.700	0.750	0.300		-1626.007	
	Total Quantity						22113.216 cum	
	Total Deducted Quantity						-4783.255 cum	
	Net Total Quantity						17329.961 cum	
	Say 17329.961 cum @ Rs 2102.04 / cum						Rs 36428271.22	
SI No	Description	No	L	B	D	CF	Quantity	Remark
2 Construction of RCC M30 Concrete Manholes of 1.2m and 1.5m diameter using sulphate resistant Cement and corrosion resistant steel reinforcement for Elamkulam sewer network system								
1	od238490/2022_2023 Construction of manhole of 1.2m diameter for an average depth of 1.3m (depth up to 1.5m) including, earth work in excavation by mechanical means of depth 0-1.5m including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter. R1							
		2415					2415.000	
	Total Quantity						2415.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						2415.000 no	
	Say 2415.000 no @ Rs 65945.41 / no						Rs 159258165.15	
2	od238621/2022_2023 Construction of manhole of 1.2m diameter for an average depth of 1.75m (depth 1.5m to 3m) including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive							

	bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter. R1						
		1221					1221.000
	Total Quantity						1221.000 no
	Total Deducted Quantity						0.000 no
	Net Total Quantity						1221.000 no
	Say 1221.000 no @ Rs 77589.61 / no						Rs 94736913.81
3	od238941/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 4.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.R1						
		127					127.000
	Total Quantity						127.000 no
	Total Deducted Quantity						0.000 no
	Net Total Quantity						127.000 no
	Say 127.000 no @ Rs 230765.67 / no						Rs 29307240.09
4	od238942/2022_2023 Construction of manhole of 1.2m diameter for an average depth of 2.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter.R2						

		615					615.000	
	Total Quantity						615.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						615.000 no	
	Say 615.000 no @ Rs 111913.15 / no						Rs 68826587.25	
5	od238980/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 3.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter. R1							
		265					265.000	
	Total Quantity						265.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						265.000 no	
	Say 265.000 no @ Rs 182844.42 / no						Rs 48453771.30	
6	od238931/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 3.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.R1							
		211					211.000	
	Total Quantity						211.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						211.000 no	

	Say 211.000 no @ Rs 204075.70 / no						Rs 43059972.70	
7	od238909/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 2.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter. R1							
		377					377.000	
	Total Quantity						377.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						377.000 no	
	Say 377.000 no @ Rs 159117.03 / no						Rs 59987120.31	
8	od238960/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 4.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.R1							
		59					59.000	
	Total Quantity						59.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						59.000 no	
	Say 59.000 no @ Rs 253001.24 / no						Rs 14927073.16	
9	od238982/2022_2023 Construction of manhole of 1.5m diameter for an average depth of 5.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed							

	cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter. R2							
		18					18.000	
	Total Quantity						18.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						18.000 no	
	Say 18.000 no @ Rs 274590.02 / no						Rs 4942620.36	
SI No	Description	No	L	B	D	CF	Quantity	Remark
3 Construction of RCC M30 Concrete Lift manholes of 2.5m diameter lift manholes for Elamkulam sewer network system								
1	od225041/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 5.35m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, errection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.							
	KR RD M4	1					1.000	
	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 499112.49 / no						Rs 499112.49	
2	od225044/2022_2023 Construction of manhole of 3.5m diameter for an average depth of 5m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth							

	level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.						
	MPK LN RD M3	1					1.000
	Total Quantity						1.000 no
	Total Deducted Quantity						0.000 no
	Net Total Quantity						1.000 no
	Say 1.000 no @ Rs 611678.75 / no						Rs 611678.75
3	od225047/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 6.13m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.						
	PNL RD M12	1					1.000
	Total Quantity						1.000 no
	Total Deducted Quantity						0.000 no
	Net Total Quantity						1.000 no
	Say 1.000 no @ Rs 552934.17 / no						Rs 552934.17
4	od225049/2022_2023 Construction of manhole of 3m diameter for an average depth of 6.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet,						

	outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete.						
	VBWL M9	1				1.000	
	Total Quantity						1.000 no
	Total Deducted Quantity						0.000 no
	Net Total Quantity						1.000 no
	Say 1.000 no @ Rs 679364.20 / no						Rs 679364.20
5	od225051/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 4.99m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete.						
	AHLN RD M18.4	1				1.000	
	Total Quantity						1.000 no
	Total Deducted Quantity						0.000 no
	Net Total Quantity						1.000 no
	Say 1.000 no @ Rs 417857.95 / no						Rs 417857.95
6	od225053/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 5.51m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.						
	AT RD M19A	1				1.000	
	Total Quantity						1.000 no

Total Deducted Quantity							0.000 no
Net Total Quantity							1.000 no
Say 1.000 no @ Rs 510096.57 / no							Rs 510096.57
7	od225054/2022_2023 Construction of manhole of 2.5m diameter for an average depth of 6.01m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.						
	CHR RD M27	1					1.000
Total Quantity							1.000 no
Total Deducted Quantity							0.000 no
Net Total Quantity							1.000 no
Say 1.000 no @ Rs 542451.77 / no							Rs 542451.77
8	od235042/2022_2023 Providing nonclog submercible pumpset of suitable capacity (5 HP) in lift manholes/ lifting stations for lifting and conveying the sewer load to the nearest manholes including pumping main of suitable size electrical installations such as cables, switch boxes,MCC panels, isolators ,float switches etc complete necessary for functioning of lifting stations all as directed by Engineer in charge. (For Elamkulam STP)						
		1					1.000
Total Quantity							1.000 each
Total Deducted Quantity							0.000 each
Net Total Quantity							1.000 each
Say 1.000 each @ Rs 455627.41 / each							Rs 455627.41
9	od235048/2022_2023 Providing nonclog submercible pumpset of suitable capacity (2 HP) in lift manholes/ lifting stations for lifting and conveying the sewer load to the nearest manholes including pumping main of suitable size electrical installations such as cables, switch boxes,MCC panels, isolators ,float switches etc complete necessary for functioning of lifting stations all as directed by Engineer in charge. (For Elamkulam STP)						
		5					5.000
Total Quantity							5.000 each
Total Deducted Quantity							0.000 each

	Net Total Quantity						5.000 each	
	Say 5.000 each @ Rs 404707.60 / each						Rs 2023538.00	
10	od235058/2022_2023 Providing nonclog submercible pumpset of suitable capacity (3 HP) in lift manholes/ lifting stations for lifting and conveying the sewer load to the nearest manholes including pumping main of suitable size electrical installations such as cables, switch boxes,MCC panels, isolators ,float switches etc complete necessary for functioning of lifting stations all as directed by Engineer in charge. (For Elamkulam STP)							
		1					1.000	
	Total Quantity						1.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						1.000 each	
	Say 1.000 each @ Rs 385051.23 / each						Rs 385051.23	
SI No	Description	No	L	B	D	CF	Quantity	Remark
4 Design,Supply & delivery, construction and commissioning of all allied components for Wet-well1 (Block 12A),Wet-well 2 (Block 12B), Wet well 3 (Block 7) and Wet well 4 (Block 5) with allied components as per standard specifications								
1	od238117/2022_2023 Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 1 with Screen and grit wells for Block 12A of Elamkulam Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, Construction of Control room with all facilities integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser, generator pedestal, Construction of compound wall 2.5meter height with barbed wire fencing 1.2m high , with a wicket gate along with main gate of adequate size etc complete as per specifications for highest quality standards - 1 no							
		1					1.000	
	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 10810000.00 / no						Rs 10810000.00	
2	od238168/2022_2023 Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 2 with Screen and grit wells for Block 12B of Elamkulam Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, Construction of pump room with facilities,Control room integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser ,Construction of compound wall 2.5meter height with barbed wire fencing 1.2m high , with a wicket gate along with main gate of adequate							

	size etc complete as per specifications for highest quality standards - 1 no							
		1					1.000	
	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 16083000.00 / no						Rs 16083000.00	
3	od238281/2022_2023 Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 3 with Screen and grit wells for Block 7 and KWA load of Elamkulam Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWFwith optimal pump-set operating plan with stand-bye pumps,compatible capacity silent generator set meeting CPCB norms of reputed make including wiring,mounting,roofing sheets, change over switches, Construction of pump room with facilities, Control room integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser,Construction of compound wall 2.5meter height with barbed wire fencing 1.2m high , with a wicket gate along with main gate of adequate size etc complete asper specifications for highest quality standards - 1 no							
		1					1.000	
	Total Quantity						1.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						1.000 set	
	Say 1.000 set @ Rs 13072000.00 / set						Rs 13072000.00	
4	od238243/2022_2023 Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 4 with Screen and grit wells for Block 5 of Elamkulam Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, Construction of pump room with facilities, Control room integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser, Construction of compound wall 2.5meter height with barbed wire fencing 1.2m high , with a wicket gate along with main gate of adequate size etc complete as per specifications for highest quality standards - 1 no							
		1					1.000	
	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 14752000.00 / no						Rs 14752000.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark

5 Supply & Delivery, laying of pumping main including Air and Scour valves to Pumping mains 4 nos for Elamkulam Collection system								
1	2.10.1.3 Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil. and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m:Pipes, cables etc. exceeding 300 mm dia but not exceeding 600 mm							
	300mm Dia DI pipe (WW1-WW2)	1	2030.000				2030.000	
	350mm Dia DI pipe (WW2-IC)	1	3500.000				3500.000	
	350mm Dia DI pipe (WW3-CP)	1	2550.000				2550.000	
	350mm Dia DI pipe (WW4-IC)	1	300.000				300.000	
	Total Quantity						8380.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						8380.000 metre	
	Say 8380.000 metre @ Rs 669.27 / metre						Rs 5608482.60	
2	100.7.1 Bailing out water with 5 HP engine and pumpset including conveyance to the site, errection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete. NEW DATA (Prepared based on PHED SDB - Item No.1070)							
	300mm Dia DI pipe (WW1-WW2)	2030/100	8.000	5.000	0.746		605.753	
	350mm Dia DI pipe (WW2-IC)	3500/100	8.000	5.000	0.746		1044.401	
	350mm Dia DI pipe (WW3-CP)	2550/100	8.000	5.000	0.746		760.920	
	350mm Dia DI pipe (WW4-IC)	300/100	8.000	5.000	0.746		89.520	
	Total Quantity						2500.594 Kwh	
	Total Deducted Quantity						0.000 Kwh	
	Net Total Quantity						2500.594 Kwh	
	Say 2500.594 Kwh @ Rs 36.95 / Kwh						Rs 92396.95	
3	60.2.7							

	BAILING OUT WATER BY ENGAGING COOLIE - Bailing out water by engaging coolie where ever necessary where pumping with engine and pump set not possible							
	300mm Dia DI pipe (WW1-WW2)	21					21.000	
	350mm Dia DI pipe (WW2-IC)	36					36.000	
	350mm Dia DI pipe (WW3-CP)	26					26.000	
	350mm Dia DI pipe (WW4-IC)	31					31.000	
	Total Quantity						114.000 Day	
	Total Deducted Quantity						0.000 Day	
	Net Total Quantity						114.000 Day	
	Say 114.000 Day @ Rs 878.76 / Day						Rs 100178.64	
4	od243527/2022_2023 Providing steel sheet shoring to the sides of the trenches upto a an average depth of 2.5 m using 6mm M.S. sheet 0.5m wide, stiffened on edges with 50mm x 50mm x 6mm MS angles driving down vertically on either side one after another in line and level with suitable pile driving equipments and accessories to a maximum depth of 0.50 M below the bottom of the proposed excavation 0.5 M above ground level suitably braced by horizontal walling pieces at 75 x 150 mm x 8 mm angles on either side at intervals not exceeding 1.50M and horizontal screw jack type struts at 1.50M intervals and maintaining the shoring till the pipes are laid and works are completed, dismantling, cleaning and restacking for reuse including all labour, hire charges and conveyance for equipments, tools and plants and sundries etc. complete.							
	350mm Dia DI pipe (WW3-CP) (Pipe laying along the canal)	2	2000.000	1.300			5200.000	
	350mm Dia DI pipe (WW4-IC) (Pipe laying along the sub canal and Chilavanoor canal)	2	200.000	1.300			520.000	
	Total Quantity						5720.000 per sqm	
	Total Deducted Quantity						0.000 per sqm	
	Net Total Quantity						5720.000 per sqm	
	Say 5720.000 per sqm @ Rs 407.25 / per sqm						Rs 2329470.00	
5	2.16.1 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).Depth not exceeding 1.5m							
	20% is Considered							

	300mm Dia DI pipe (WW1-WW2)	2	2030.000		1.250	0.2	1015.000	
	350mm Dia DI pipe (WW2-IC)	2	3500.000		1.300	0.2	1820.000	
	350mm Dia DI pipe (WW3-CP)	2	550.000		1.300	0.2	286.000	
	350mm Dia DI pipe (WW4-IC)	2	100.000		1.300	0.2	52.000	
	Total Quantity						3173.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						3173.000 sqm	
	Say 3173.000 sqm @ Rs 152.95 / sqm						Rs 485310.35	
6	100.14.5 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 300 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.19 in DAR							
		1	2030.000				2030.000	
	Total Quantity						2030.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						2030.000 metre	
	Say 2030.000 metre @ Rs 205.15 / metre						Rs 416454.50	
7	100.14.6 Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials : 350 mm dia Ductile Iron Class K-9 Pipes Data derived from 18.72.20 in DAR							
	350mm Dia DI pipe (WW2-IC)-PM2	1	3500.000				3500.000	
	350mm Dia DI pipe (WW2-IC)-PM3	1	2550.000				2550.000	
	350mm Dia DI pipe (WW2-IC)-PM4	1	300.000				300.000	
	Total Quantity						6350.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						6350.000 metre	
	Say 6350.000 metre @ Rs 271.79 / metre						Rs 1725866.50	

8	18.30.7 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:300 mm diameter pipe						
		2					2.000
	Total Quantity						2.000 no
	Total Deducted Quantity						0.000 no
	Net Total Quantity						2.000 no
	Say 2.000 no @ Rs 578.43 / no						Rs 1156.86
9	18.30.8 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:350 mm diameter pipe						
		6					6.000
	Total Quantity						6.000 no
	Total Deducted Quantity						0.000 no
	Net Total Quantity						6.000 no
	Say 6.000 no @ Rs 777.41 / no						Rs 4664.46
10	18.70.5 Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and including the cost of rubber gasket:300 mm dia pipe						
	2000/5.5	364					364.000
	Total Quantity						364.000 joint
	Total Deducted Quantity						0.000 joint
	Net Total Quantity						364.000 joint
	Say 364.000 joint @ Rs 412.60 / joint						Rs 150186.40
11	18.70.6 Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and including the cost of rubber gasket:350 mm dia pipes						
	PM2- 3500/5.5	637					637.000
	PM3- 2550/5.5	464					464.000
	PM4- 300/5.5	55					55.000
	Total Quantity						1156.000 joint
	Total Deducted Quantity						0.000 joint
	Net Total Quantity						1156.000 joint
	Say 1156.000 joint @ Rs 437.75 / joint						Rs 506039.00
12	18.83.7 Labour for cutting C.I. pipe with steel saw.300 mm diameter C.I. pipe						

		20					20.000	
	Total Quantity						20.000	Each Cut
	Total Deducted Quantity						0.000	Each Cut
	Net Total Quantity						20.000	Each Cut
	Say 20.000 Each Cut @ Rs 643.44 / Each Cut						Rs 12868.80	
13	18.83.8 Labour for cutting C.I. pipe with steel saw.350 mm diameter C.I pipe							
		35+26+3					64.000	
	Total Quantity						64.000	Each Cut
	Total Deducted Quantity						0.000	Each Cut
	Net Total Quantity						64.000	Each Cut
	Say 64.000 Each Cut @ Rs 748.32 / Each Cut						Rs 47892.48	
14	100.35.5 Testing 300mm DI/CI pipeline with potable water to the required test pressure. 300 mm dia Observed Data derived from item no.1023 of PHED DATA							
		1	2030.000				2030.000	
	Total Quantity						2030.000	metre
	Total Deducted Quantity						0.000	metre
	Net Total Quantity						2030.000	metre
	Say 2030.000 metre @ Rs 55.59 / metre						Rs 112847.70	
15	100.35.6 Testing 350mm DI/CI pipeline with potable water to the required test pressure. 350 mm dia Observed Data derived from item no.1024 of PHED DATA							
	350mm Dia DI pipe (WW2-IC)-PM2	1	3500.000				3500.000	
	350mm Dia DI pipe (WW2-IC)-PM3	1	2550.000				2550.000	
	350mm Dia DI pipe (WW2-IC)-PM4	1	300.000				300.000	
	Total Quantity						6350.000	metre
	Total Deducted Quantity						0.000	metre
	Net Total Quantity						6350.000	metre
	Say 6350.000 metre @ Rs 67.85 / metre						Rs 430847.50	
16	100.98.119							

	Supply of DI K9 Pipe Conforming to IS 8329/2000, 300mm Dia.							
		1	2030.000				2030.000	
	Total Quantity						2030.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						2030.000 metre	
	Say 2030.000 metre @ Rs 3537.65 / metre						Rs 7181429.50	
17	100.98.120 Supply of DI K9 Pipe Conforming to IS 8329/2000, 350mm Dia.							
	350mm Dia DI pipe (WW2-IC)-PM2	1	3500.000				3500.000	
	350mm Dia DI pipe (WW2-IC)-PM3	1	2550.000				2550.000	
	350mm Dia DI pipe (WW2-IC)-PM4	1	300.000				300.000	
	Total Quantity						6350.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						6350.000 metre	
	Say 6350.000 metre @ Rs 4333.00 / metre						Rs 27514550.00	
18	18.69.1 Providing and laying D.I Specials of Class K - 12 suitable for mechanical jointing as per IS : 9523 :Upto 600 mm dia							
	300mm dia 90 degree socket bend	9	70.000	1/100			6.301	
	350mm dia 90 degree socket bend	10	97.000	1/100			9.700	
	300mm dia 45 degree socket bend	2	77.000	1/100			1.540	
	350mm dia 45 degree socket bend	8	83.000	1/100			6.641	
	300mm dia 22.5 degree socket bend	2	79.000	1/100			1.580	
	350mm dia 22.5 degree socket bend	3	84.000	1/100			2.520	
	300mm dia 11.25 degree socket bend	9	80.000	1/100			7.200	
	350mm dia 11.25 degree socket bend	7	85.000	1/100			5.950	

	300mm dia MJ colar	4	59.000	1/100			2.360	
	350mm dia MJ colar	10	80.000	1/100			8.000	
	Total Quantity						51.792 quintal	
	Total Deducted Quantity						0.000 quintal	
	Net Total Quantity						51.792 quintal	
	Say 51.792 quintal @ Rs 21145.26 / quintal						Rs 1095155.31	
19	od238709/2022_2023 Providing, laying and fixing C.I. sluice valves (with cap) and connecting lead dwc pipe of 200mm dia to the nearest manhole considering an average distance. all completme with bolts, nuts, rubber installation etc. cost include all necessary specials, labour ,material,etc all complete. 200mm dia							
		3					3.000	
	Total Quantity						3.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						3.000 no	
	Say 3.000 no @ Rs 64876.62 / no						Rs 194629.86	
20	od225067/2022_2023 Supplying and fixing C.I double acting air valve of approved quality with bolts, nuts, rubber placing including cost of air valves, specials, labour, hire charges etc. complete 80 mm dia							
	For 3 nos pumping mains	8					8.000	
	Total Quantity						8.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						8.000 no	
	Say 8.000 no @ Rs 7363.73 / no						Rs 58909.84	
21	5.2.2 Reinforced cement concrete work in walls (any thickness), including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, piers, abutments, posts and struts etc. up tot floor five level excluding cost of centering, shuttering, finishing and reinforcement :1:1.5:3(1 cement : 1.5 coarse sand : 3 graded stone aggregate 20 mm nominal size)							
	For anchor blocks and pipe supports	29	2.000	1.000	0.800		46.401	
	Total Quantity						46.401 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						46.401 cum	
	Say 46.401 cum @ Rs 10954.04 / cum						Rs 508278.41	
22	od225071/2022_2023							

	Extra for providing sulphate resistant cement for the structures above plinth level.							
	For anchor blocks and pipe supports	29	2.000	1.000	0.800		46.401	
	Total Quantity						46.401 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						46.401 cum	
	Say 46.401 cum @ Rs 1916.05 / cum						Rs 88906.64	
23	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	@80kg/cum	46.401				80.0	3712.081	
	Total Quantity						3712.081 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						3712.081 kilogram	
	Say 3712.081 kilogram @ Rs 98.30 / kilogram						Rs 364897.56	
24	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		1	3712.081	0.0508			188.574	
	Total Quantity						188.574 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						188.574 sqm	
	Say 188.574 sqm @ Rs 223.32 / sqm						Rs 42112.35	
25	50.2.25.1 Filling with contractor's own earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m as per direction of site Engineer-in-charge							
	300mm Dia DI pipe (WW1-WW2)	1	2030.000	1.000	1.250	0.1	253.750	
	350mm Dia DI pipe (WW2-IC)	1	3500.000	1.100	1.300	0.1	500.501	
	350mm Dia DI pipe (WW3-CP)	1	2550.000	1.100	1.300	0.1	364.651	
	350mm Dia DI pipe (WW4-IC)	1	300.000	1.100	1.300	0.1	42.901	
	Total Quantity						1161.803 cum	

Total Deducted Quantity							0.000 cum
Net Total Quantity							1161.803 cum
Say 1161.803 cum @ Rs 525.82 / cum							Rs 610899.25
26	51.2.3 Filling with Quarry Muck Filling up low lying and water logged areas with local material/ quarry muck, spreading in layers, leveling the top at site and consolidation by ramming, etc complete for improving the CBR value of subgrade						
	300mm Dia DI pipe (WW1-WW2)	1	2030.000	1.000	1.250	0.1	253.750
	350mm Dia DI pipe (WW2-IC)	1	3500.000	1.100	1.300	0.1	500.501
	350mm Dia DI pipe (WW3-CP)	1	2550.000	1.100	1.300	0.1	364.651
	350mm Dia DI pipe (WW4-IC)	1	300.000	1.100	1.300	0.1	42.901
Total Quantity							1161.803 cum
Total Deducted Quantity							0.000 cum
Net Total Quantity							1161.803 cum
Say 1161.803 cum @ Rs 902.34 / cum							Rs 1048341.32
27	od238307/2022_2023 Construction valve chamber of suitable size for air valves and Scour valves in the pumping mains including earthwork excavation by manually/mechanically, backfilling the trenches ,sandfilling for a thickness of 15cm over which levelling course 1:3:6 with 40mm aggregates RCC walls M30 grade for bottom slab and side walls, precast RCC M15 cover slab including form work and steel reinforcement, Plastering inside with cement mortar 1:3 (SRC) for 20mm thick,Plastering outside with cement mortar 1:3 (SRC) for 12mm thick,Refilling with excavated soil ,Disposal of surplus earth work,Supplying and fixing CI stepsetc complete all cost for labour materials, hire charges for tools and plants .conveyance charges etc complete 11 Nos for Elamkulam Pumping mains						
		1					1.000
Total Quantity							1.000 set
Total Deducted Quantity							0.000 set
Net Total Quantity							1.000 set
Say 1.000 set @ Rs 1181525.86 / set							Rs 1181525.86
SI No	Description	No	L	B	D	CF	Quantity
6 Laying of pipes under NH 66 and PWD Road by HDD method to Elamkulam STP							

1	od225056/2022_2023 Drilling of 600mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 500mm dia M.S casing pipe of minimum 8mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority							
	350mm dia PM2	1	45.000				45.000	
	300mm dia PM1	1	60.000				60.000	
	253mm dia TM	1	80.000				80.000	
	Total Quantity						185.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						185.000 metre	
	Say 185.000 metre @ Rs 10646.31 / metre						Rs 1969567.35	
2	od236528/2022_2023 Drilling of 1300mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 1200mm dia M.S casing pipe of minimum 8mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority.							
	630mm dia TM	1	45.000				45.000	
	Total Quantity						45.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						45.000 metre	
	Say 45.000 metre @ Rs 42491.15 / metre						Rs 1912101.75	
SI No	Description	No	L	B	D	CF	Quantity	Remark
7 Laying of pipes under railway lines by HDD method to Elamkulam STP								
1	od225056/2022_2023 Drilling of 600mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 500mm dia M.S casing pipe of minimum 8mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority							
	For 350mm Dia pipe	1	450.000				450.000	
	Total Quantity						450.000 metre	
	Total Deducted Quantity						0.000 metre	

	Net Total Quantity						450.000 metre	
	Say 450.000 metre @ Rs 10646.31 / metre						Rs 4790839.50	
SI No	Description	No	L	B	D	CF	Quantity	Remark
8 ROAD RESTORATION CHARGES								
1	od225029/2022_2023 Road Restoration Charges for BM&BC as per the directions of Engineer (PWD Road)							
	(0m to 1.5m)70% of sewer lines Tar roads							
	200mm dia pipe	1	60668.626	0.750	1.500	0.7	47776.543	
	250mm dia pipe	1	265.925	0.750	1.500	0.7	209.416	
	300mm	1	41.000	0.750	1.500	0.7	32.288	
	0 to 3m (70% of sewer lines Tar roads)							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	54346.631	1.350	1.500	0.7	77036.350	
	250mm dia pipe	1	1266.289	1.350	1.500	0.7	1794.965	
	300mm dia pipe	1	77.000	1.350	1.500	0.7	109.148	
	400mm dia pipe	1	992.862	1.500	1.500	0.7	1563.758	
	450mm dia pipe	1	94.000	1.600	1.500	0.7	157.921	
	0 to 4.5m70% of sewer lines Tar roads							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	8384.1991	0.950	1.500	0.7	8363.239	
	250mm dia pipe	1	3934.016	0.950	1.500	0.7	3924.181	
	300mm dia	1	894.488	0.950	1.500	0.7	892.252	
	400mm dia pipe	1	581.000	1.100	1.500	0.7	671.056	
	450mm	1	678.000	1.200	1.500	0.7	854.280	
	500mm	1	751.000	1.250	1.500	0.7	985.688	
	560mm	1	157.000	1.300	1.500	0.7	214.305	
	Above 4.5m)70% of sewer lines Tar roads							
	depth of cutting upto 1.5m,200mm dia pipe	1	285.992	0.950	1.500	0.7	285.278	
	250mm dia pipe	1	351.203	0.950	1.500	0.7	350.325	
	450mm dia pipe	1	280.000	1.200	1.500	0.7	352.800	
	500mm dia	1	159.000	1.250	1.500	0.7	208.688	
	560mm dia	1	491.000	1.300	1.500	0.7	670.215	
	630mm dia	1	383.000	1.400	1.500	0.7	563.010	

	Total Quantity						147015.706 per sqm	
	Total Deducted Quantity						0.000 per sqm	
	Net Total Quantity						147015.706 per sqm	
	Say 147015.706 per sqm @ Rs 3167.05 / per sqm						Rs 465606091.69	
2	od225034/2022_2023 Road Restoration Charges for CC roads as per the directions of Engineer (PWD Road)							
	(0m to 1.5m)10% of sewer lines roads							
	200mm dia pipe	1	60668.626	0.750	1.500	0.1	6825.221	
	250mm dia pipe	1	265.925	0.750	1.500	0.1	29.917	
	300mm	1	41.000	0.750	1.500	0.1	4.613	
	0 to 3m (10% of sewer lines roads)							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	54346.631	1.350	1.500	0.1	11005.193	
	250mm dia pipe	1	1266.289	1.350	1.500	0.1	256.424	
	300mm dia pipe	1	77.000	1.350	1.500	0.1	15.593	
	400mm dia pipe	1	992.862	1.500	1.500	0.1	223.394	
	450mm dia pipe	1	94.000	1.600	1.500	0.1	22.561	
	0 to 4.5m10% of sewer lines Tar roads							
	Depth of cutting upto 1.5m, 200mm dia pipe	1	8384.1991	0.950	1.500	0.1	1194.749	
	250mm dia pipe	1	3934.016	0.950	1.500	0.1	560.598	
	300mm dia	1	894.488	0.950	1.500	0.1	127.465	
	400mm dia pipe	1	581.000	1.100	1.500	0.1	95.866	
	450mm	1	678.000	1.200	1.500	0.1	122.041	
	500mm	1	751.000	1.250	1.500	0.1	140.813	
	560mm	1	157.000	1.300	1.500	0.1	30.615	
	Above 4.5m)10% of sewer lines Tar roads							
	depth of cutting upto 1.5m,200mm dia pipe	1	285.992	0.950	1.500	0.1	40.754	
	250mm dia pipe	1	351.203	0.950	1.500	0.1	50.047	
	450mm dia pipe	1	280.000	1.200	1.500	0.1	50.401	
	500mm dia	1	159.000	1.250	1.500	0.1	29.813	
	560mm dia	1	491.000	1.300	1.500	0.1	95.745	
	630mm dia	1	383.000	1.400	1.500	0.1	80.430	

Total Quantity							21002.253 per sqm	
Total Deducted Quantity							0.000 per sqm	
Net Total Quantity							21002.253 per sqm	
Say 21002.253 per sqm @ Rs 4195.88 / per sqm							Rs 88122933.32	
SI No	Description	No	L	B	D	CF	Quantity	Remark
9 Household Connection								
1	od225028/2022_2023 Carrying out Household Survey for Sewerage System including all Preparatory Works, Tool Preparation, Data Collection Charges, Interviews, Data Entry, Field level monitoring, Data Verification all allied works							
	R e s i d e n t i a l c o n n e c t i o n	14357					14357.000	
	C o m m e r c i a l Connection (Based on 2025 population 7 3 2 5 3 , 2 % c o n s i d e r e d)	294					294.000	
Total Quantity							14651.000 each	
Total Deducted Quantity							0.000 each	
Net Total Quantity							14651.000 each	
Say 14651.000 each @ Rs 74.41 / each							Rs 1090180.91	
2	od225035/2022_2023 Providing sewer connection to the existing households and commercialunits including the cost for all suppying and laying suitable size sewer pipeline , Demolishing cement concrete manually / by mechanical means including disposal of material , Earthwork excavation and backfilling after laying works,Constructing brick masonry chamber for underground C.I. inpection chamber and bends with bricks in cement mortar 1:4 (1 cement: 4 coarse sand) C.I.cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover with frame to be not less than 38 kg (weight of cover 23kg and weight of frame 15 kg), R.C.C top slab with 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) foundation concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement: 3 coarse sand) finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete as per standard design: Inside dimensions 455x610 mm and 45 cm deep for single pipe line: With common burnt clay F.P.S. (non modular) bricks of class designation 7.5, cement concrete levelling course 1:2:4 , including KWA sewer connection fee & Documentation charge etc complete as directed by Engineer in charge							
	R e s i d e n t i a l c o n n e c t i o n	14357					14357.000	
	C o m m e r c i a l C o n n e c t i o n	294					294.000	
Total Quantity							14651.000 no	

	Total Deducted Quantity						0.000 no	
	Net Total Quantity						14651.000 no	
	Say 14651.000 no @ Rs 14900.62 / no						Rs 218308983.62	
3	od225043/2022_2023 Suupplying conveying and laying pipes and specials ISI marked 160mm dia uPVC SN4 pipes having including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying UPVC pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 160 mm nominal outer dia pipes.							
	C o m m e r c i a l Connection(Taking average length of 10m)	294	10.000				2940.000	
	Total Quantity						2940.000 per metre	
	Total Deducted Quantity						0.000 per metre	
	Net Total Quantity						2940.000 per metre	
	Say 2940.000 per metre @ Rs 981.33 / per metre						Rs 2885110.20	
4	od225045/2022_2023 Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.							
	Taking average length of 30m for 6 houses to single MH	14357/6	30.000				71785.000	
	Total Quantity						71785.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						71785.000 metre	
	Say 71785.000 metre @ Rs 512.22 / metre						Rs 36769712.70	
SI No	Description	No	L	B	D	CF	Quantity	Remark
10 Sewer cleaning and Flushing vehicles (5nos),Jet rodding machine, Manhole silt removal and Sewer Flushing, including odour control arrangements								

1	od225037/2022_2023 Purchasing LCV mounted sewer suction cum Jetting machine of 4000 liters tank capacity, Tank shell thickness of 5 mm, Jetting Pump Capacity of 100 lpm at a pressure of 150 Bar and Vacuum Pump Capacity of 5300 lpm etc with all other technical specification as specified in the NIT including transportation, Transits insurance, Entry tax, RTO registration , Temporary registration etc. complete							
		1					1.000	
	Total Quantity						1.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						1.000 no	
	Say 1.000 no @ Rs 4556258.05 / no						Rs 4556258.05	
2	od225039/2022_2023 Supply, testing and commissioning Hydraulic operated cum Winch Driven De-Silting Grab Bucket System inclusive of four-wheeler of Make TATA 275 /TATA ACE or Equipment Vehicle with system having traveling depth of at least 12 m, steel grab bucket of 20litres capacity, hydraulic system driven by vehicle engine. 8mm wire rope with appropriate size reel, with hydraulic cylinder, hydro motor, flexible hose, oil tank, hopper boom, hose of appropriate size etc. complete with valves, instruments, accessories with cost of vehicle etc. complete conforming with tender specifications- GWSSB SoR							
		1					1.000	
	Total Quantity						1.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						1.000 set	
	Say 1.000 set @ Rs 862597.01 / set						Rs 862597.01	
3	od225042/2022_2023 Supplying, testing and Commissioning Jotting machinery inclusive of Four wheeler of MAKE TATA 275/TATA ACE or Equivalent vehicle with suitable RPM Triplex Plunger Pump having minimum capacity 13 LPM and minimum pressure 200 BAR directly coupled with a separate 10 HP heavy duty, 4 stoke, air cooled diesel Engine, withwater tank having capacity 500 lit, with jetting hose of 30 m length with ID ¼",etc. complete with hose reel, spraying hose and gun, valves, instruments, accessories with cost of vehicles etc. complete conforming with tender specifications.							
		1					1.000	
	Total Quantity						1.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						1.000 set	
	Say 1.000 set @ Rs 890422.98 / set						Rs 890422.98	
4	od225046/2022_2023 Providing operationg Non-Motorised Manhole cleaner: Manual Grab to scrap and collect solids from manholes with Collection bucket of not less than 6 litres having extension rod of minimum 2 m adjustable upto 3m with all allied accessories conforming to standard specifications							

		5					5.000	
	Total Quantity						5.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						5.000 set	
	Say 5.000 set @ Rs 20000.00 / set						Rs 100000.00	
5	od225048/2022_2023 Vehicle Mounted High Pressure Jetting cum Sewer Suction Machine mounted on a vehicle of 16 T GVW Chassis with small wheel base and suitable for cleaning the Sewer Line in the lanes and by lanes in the City with tank capacity of minimum 7000 Litres having clean water and sludge collection tank capable of efficiently working in sewer lines of diameters ranging from 200-600 mm, suitable for dislodging and removing obstruction and blockages from Sewer line by High Pressure Water Jetting System with requisite pressure take off and suctioning the sludge/slurry from sewers/ manholes through suitably dimensioned jetting hoses and nozzles aspirating the dislodged effluent and treating it in the filtration unit for recycling the liquid filtered/cleaned in multiple stages and is used for jetting purposes and transporting only the sludge to any desired disposal site for emptying the collected sludge under gravity in the tipping site with ease of cleaning, clearing and maintenance with dignity compliant to MS Act,2013, Noise & safety standards etc with all statutory norms/clearances applicable including MV Act provisions etc complete.							
		1					1.000	
	Total Quantity						1.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						1.000 set	
	Say 1.000 set @ Rs 5999999.99 / set						Rs 5999999.99	
6	od242912/2022_2023 Vehicle Mounted High Pressure Jetting cum Sewer Suction Machine chassis mounted on a vehicle of 9 T GVW having clean water and sludge collection tank of minimum 7000 l capacity capable of efficiently working in sewer lines of diameters ranging from 200-600 mm, suitable for dislodging and removing obstruction and blockages from Sewer line by High Pressure Water Jetting System with requisite pressure take off and suctioning the sludge/slurry from sewers/ manholes through suitably dimensioned jetting hoses and nozzles aspirating the dislodged effluent and transporting the same to any desired disposal site for emptying the collected sludge under gravity in the tipping site with ease of maintenance and dignity in cleaning, clearing in compliance with to Manual Scavenging Act,2013, applicable Noise Pollution (Regulation and Control) Rules 2000, safety standards statutory norms/clearances/and MV Act,2019 provisions including Advanced Odour Control arrangements (2 nos) including suction hoses, hydraulic system, control units, valves and accessories as per sturdy standards and specifications and commissioning etc complete							
		1					1.000	
	Total Quantity						1.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						1.000 set	

	Say 1.000 set @ Rs 5000000.00 / set						Rs 5000000.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
11 Utility shifting works and its restoration as directed by the Department								
Lump-Sum Total						Rs 20350000.00		
	SI No	Description	No	L	B	D	CF	Quantity
Remark	12 Additional cost for SCADA, Solar system for sewer network system							
Lump-Sum Total						Rs 15000000.00		
	SI No	Description	No	L	B	D	CF	Quantity
Remark	13 Annual maintenance for sewer network , lift manhole automation , pump sets, wetwell cum pump stations and energy charges etc for 10 Years							
Lump-Sum Total						Rs 195900000.00		
	SI No	Description	No	L	B	D	CF	Quantity
Remark	14 Cost for silent generator set ,connection all allied works of lift manholes							
Lump-Sum Total						Rs 5000000.00		
	Provision for GST payments (in %) @						18.0%	
Amount reserved for GST payments						405508185.55		
Total						2658331438.55		
Lumpsum for round off						8561.45		
Other Engineering Organisations						TOTAL Rs 2658340000.00		
						Rounded Total Rs 2,65,83,40,000		
Rupees Two Hundred Sixty Five Crore Eighty Three Lakh Forty Thousand Only								

(Cost Index Applied for this estimate is 35.59%)

Data Analysis

Supply & Delivery, laying, jointing, testing, trial run, and commissioning of sewer lines for Elamkulam Collection System					
1 Specification Code: 15.43.2					

15.43 Dismantling manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charge:

15.43.2 Bituminous road

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 36 sqm consider a road 6 metres wide and 6 metres length wise 30 cm average depth = 10.80 cubic metre LABOUR: For cutting road taking out soling and metalling including sorting and screening				
0114	Beldar	Day	9.6	558.00	5356.80
0115	Coolie	Day	4.8	558.00	2678.40
9999	Sundries-Labour for stacking of serviceable material and disposal of unserviceable material within 50 metre lead	L.S	107.64	2.00	215.28
TOTAL					8250.48
Add Water Charges @ 1%					82.50
TOTAL					8332.98
Add CPOH @ 15%					1249.95
TOTAL					9582.93
Cost of 36.0 sqm					9582.93
Cost per sqm					266.19
Say					266.2

	Cost index 35.59 %				94.74
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	Total with Cost index				360.94
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2 Specification Code: od225040/2022_2023

od225040/2022_2023 :Cutting and removal of the bituminous / concrete roads with cutting machine for a minimum depth of 200mm along the sides of proposed alignment of the pipe to be laid without causing any damage to other utilities, including the charges for hire and conveyance of tools and plant, cost of consumables and charges for lighting, watching, ribbon fencing, caution boards, traffic diversion, and as per the direction of departmental officers etc. complete, before carrying out the demolition of bituminous / concrete road by mechanical means and carrying out the excavation. Dismantling manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer -in-Charge:

Details of cost for 36 sqm

Consider 6m wide and 6m length and 30cm average depth=10.8 cum

Code	Description	Unit	Quantity	Rate	Amount
0047	Concrete joint cutting machine	Day	0.50000	900.00	450.00
0069	Generator 250 KVA	hour	0.50000	350.00	175.00
9999	Sundries	L.S	200.00000	2.00	400.00
0114	Beldar	Day	5.00000	558.00	2790.00
0115	Coolie	Day	2.50000	558.00	1395.00
TOTAL					5210.00
	cost for 36.0 sqm				5210.00
	cost for one sqm				144.72
	say				144.72

	Add Water Charges @ 1.0%				1.44
	Add CPOH @ 15.0%				21.92
	Cost index 35.59 %				59.82
	Total with Cost index				227.92
	Say				227.92

3 Specification Code: 16.83

16.83

Taking out existing CC interlocking paver blocks from footpath/ central verge, including removal of rubbish etc., disposal of unserviceable material to the dumping ground, for which payment shall be made separately and stacking of serviceable material within 50 metre lead as per direction of Engineer-in-Charge.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm LABOUR:				
0114	Beldar	Day	0.25	558.00	139.50
0115	Coolie	Day	1.0	558.00	558.00
9999	Sundries-	L.S	2.7	2.00	5.40
TOTAL					702.90
Add Water Charges @ 1%					7.03
TOTAL					709.93
Add CPOH @ 15%					106.49
TOTAL					816.42
Cost of 10.0 sqm					816.42
Cost per sqm					81.64
Say					81.65

	Cost index 35.59 %				29.06
	Total with Cost index				110.71

4 Specification Code: 15.2.2

15.2

Demolishing cement concrete manually / by mechanical means including disposal of material within 50 metres lead as per direction of Engineer - in-Charge.

15.2.2

Nominal concrete 1:4:8 leaner mix (including equivalent design mix)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum LABOUR:				
0114	Beldar	Day	0.88	558.00	491.04
0115	Coolie	Day	0.55	558.00	306.90
9999	Sundries-	L.S	1.95	2.00	3.90
TOTAL					801.84
Add Water Charges @ 1%					8.02
TOTAL					809.86
Add CPOH @ 15%					121.48
TOTAL					931.34
Cost of 1.0 cum					931.34
Say					931.35

Other Engineering Organisations

	Cost index 35.59 %			331.47
	Total with Cost index			1262.82

5 Specification Code: 15.3

15.3

Demolishing R.C.C. work manually / by mechanical means including stacking of steel bars and disposal of unserviceable material with in 50 metres lead as per direction of Engineer -in-Charge.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum LABOUR:				
0114	Beldar	Day	2.65	558.00	1478.70
0115	Coolie	Day	0.72	558.00	401.76
9999	Sundries-	L.S	7.02	2.00	14.04

TOTAL	1894.50
Add Water Charges @ 1%	18.95
TOTAL	1913.45
Add CPOH @ 15%	287.02
TOTAL	2200.47
Cost of 1.0 cum	2200.47
Say	2200.45

Cost index 35.59 %	783.14
Total with Cost index	2983.59

6 Specification Code: 15.9.2

15.9 Demolishing stone rubble masonry manually / by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-Charges.

15.9.2 In cement mortar

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum LABOUR:				
0114	Beldar	Day	1.3	558.00	725.40
0115	Coolie	Day	1.04	558.00	580.32
9999	Sundries-	L.S	2.73	2.00	5.46
TOTAL					1311.18
Add Water Charges @ 1%					13.11
TOTAL					1324.29
Add CPOH @ 15%					198.64
TOTAL					1522.93

Cost of 1.0 cum	1522.93
Say	1522.95

Cost index 35.59 %	542.02
Total with Cost index	2064.97

7 Specification Code: 100.1.1

SUBHEAD : 100.0

KWA APPROVED DATA

100.1.1

Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m :

All kinds of soil
(Ref. Item No. 2.10.1 of DSR)

Code	Description	Unit	Quantity	Rate	Amount
	Details of Cost For 100 m3				
	Materials				
2.8.1	Rate as per item Number 2.8.1 of SH: Earth Work (DSR)	cum	100.0	219.00	21900.00(A)
2.25	Rate as per item Number 2.25 of SH: Earth Work (DSR)	cum	100.0	190.70	19070.00(A)
TOTAL					40970.00

Cost of 100.0 cum	40970.00
Cost of 1 cum	409.70
Say	409.7

Cost index	35.59 %				145.81
Total with Cost index					555.51

8 Specification Code: 100.1.2

SUBHEAD : 100.0

KWA APPROVED DATA

100.1.2

Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 1.5m but not exceeding 3 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m: 1.50m to 3.0m

All kinds of soil

(Ref. Item No. 2.11 of DSR)

Code	Description	Unit	Quantity	Rate	Amount
	Details of Cost For 100 m3				
	Materials				
2.8.1	Rate as per item Number 2.8.1 of SH: Earth Work	cum	100.0	219.00	21900.00(A)
2.25	Rate as per item Number 2.25 of SH: Earth Work	cum	100.0	190.70	19070.00(A)
2.26.1	Rate as per item Number 2.26.1 of SH: Earth Work	cum	100.0	78.45	7845.00
TOTAL					48815.00

Cost of 100.0 cum	48815.00
Cost of 1 cum	488.15
Say	488.15

Cost index	35.59 %				173.73
Total with Cost index					661.88

9 Specification Code: 100.1.3

SUBHEAD : 100.0

KWA APPROVED DATA

Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 3m in depth but not exceeding 4.5 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 3.0m to 4.50m

100.1.3

All kinds of soil

(Ref. Item No. 2.12 of DSR)

Code	Description	Unit	Quantity	Rate	Amount
	(Ref. Item No. 2.12 of DSR) Details of Cost For 100 m3				
	Materials				
2.8.1	Rate as per item Number 2.8.1 of SH: Earth Work (DSR)	cum	100.0	219.00	21900.00(A)

2.25	Rate as per item Number 2.25 of SH: Earth Work (DSR)	cum	100.0	190.70	19070.00(A)
2.26.1	Rate as per item Number 2.26.1 of SH: Earth Work (DSR)- Extra for addl. Lift	cum	100.0	78.45	7845.00
2.26.1	Rate as per item Number 2.26.1 of SH: Earth Work (DSR)- Extra for addl. Lift	cum	100.0	78.45	7845.00(A)

TOTAL					56660.00
Cost of 100.0 cum					56660.00
Cost of 1 cum					566.60
Say					566.6

Other Engineering Organisations

	Cost index	35.59 %			201.65
	Total with Cost index				768.25

10 Specification Code: 100.1.4

SUBHEAD : 100.0

KWA APPROVED DATA

100.1.4

Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth exceeding 4.5m in depth but not exceeding 6 m, including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : 4.5m to 6.0m

All kinds of soil.

(Ref. Item No. 2.12 of DSR)

Code	Description	Unit	Quantity	Rate	Amount
	Details of Cost For 100 m3				
	Materials				
2.8.1	Rate as per item Number2.8.1 of SH: Earth Work (DSR)	cum	100.0	219.00	21900.00(A)
2.25	Rate as per item Number2.25 of SH: Earth Work (DSR)	cum	100.0	190.70	19070.00(A)
2.26.1	Rate as per item Number2.26.1 of SH: Earth Work (DSR)- Extra for addl. Lift 1.5 m to 3 m	cum	100.0	78.45	7845.00
2.26.1	Rate as per item Number2.26.1 of SH: Earth Work (DSR)- Extra for addl. Lift 3 m to 4.5 m	cum	100.0	78.45	7845.00(A)
2.26.1	Rate as per item Number2.26.1 of SH: Earth Work (DSR)- Extra for addl. Lift 4.5 m to 6.0 m	cum	100.0	78.45	7845.00
TOTAL					64505.00
Cost of 100.0 cum					64505.00
Cost of 1 cum					645.05
Say					645.05

	Cost index 35.59 %				229.57
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	Total with Cost index				874.62
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11 Specification Code: 100.8.1

100.8.1 Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals.
(Data Prepared based on PWD SDB - Item No.1009)

Code	Description	Unit	Quantity	Rate	Amount
	Details of Cost for 10m Pole required for vertical Post = 6x1.65=9.90m				
KW14	Casuarina Pole girth 15cm to 24cm. Hire Charges of Casurania pole (25% of cost as hire) Quantity is taken as 1/4 of 9.9	metre	2.475	22.13	54.77
9999	Sundries-Carriage of Casurania pole	L.S	3.0	2.00	6.00
KW15	Red Coloured Fluorescent caution tape	metre	21.2	1.28	27.14
0114	Beldar Labour	Day	0.2	558.00	111.60
TOTAL					199.51
Add Water Charges @ 1%					2.00
TOTAL					201.51
Add CPOH @ 15%					30.23
TOTAL					231.74
Cost of 10.0 metre					231.74
Cost per metre					23.17
Say					23.15

	Cost index 35.59 %				4.86
	Total with Cost index				28.01

12 Specification Code: 2.16.1

2.16 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).

2.16.1 Depth not exceeding 1.5m

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a trench 30m long and 1.5 m deep. Area = $2 \times 30 \times 1.5 = 90$ sqm. MATERIAL: The material can based four times on the same work and after use of material credit is give @ 75% of cost poling boards of				
1198	Second class kail wood in planks Second class kail wood in planks $90 \times 0.038 = 3.42$ cum = 3420 cudm Qty taken for cost of using once after deducting for credit = $3420 \times 1/4 \times 1/4 = 213.75$ cudm Wallings 100mmx 100 mm of	10 cud m	213.75	260.00	5557.5
1197	Second class kail wood in scantling $4 \times 30 \times 0.10 \times 1.10 = 1.20$ cum = 1200 cudm Qty taken for cost of using once after deducting for credit = $1200 \times 1/4 \times 1/4 = 75$ cudm	10 cud m	75.0	260.00	1950.0

0302	Safeda ballies 125 mm diameter long 2x17x1.50 = 51 m Qty taken for cost of using once after deducting for credit =51x1/4x1/4=3.1875m CARRIAGE: Poling boards = 3.42 cum Walling = 1.20 cum. Balli struts : 3.14/4x(0.125)3x51= 0.63cum Total of carriage = 5.25x1/4 = 1.3125 cum	metre	3.1875	40.00	127.50
2204	Carriage of Timber	cum	1.3125	118.59	155.65
0112	Carpenter 2nd class	Day	0.5	679.00	339.50
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL					8741.97
Add Water Charges @ 1%					87.42
TOTAL					8829.39
Add CPOH @ 15%					1324.41
TOTAL					10153.80
Cost of 90.0 sqm					10153.80
Cost per sqm					112.82
Say					112.8

	Cost index 35.59 %				40.15
	Total with Cost index				152.95

13 Specification Code: 2.16.2

2.16

Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area

timbered).

2.16.2 Depth exceeding 1.5 m but not exceeding 3 m

Code	Description	Unit	Quantity	Rate	Amount
	<p>Details of cost for a trenches 30 m long and 1.5m deep</p> <p>Area = $2 \times 30 \times 1.5 = 90$ sqm</p> <p>MATERIAL:</p> <p>The Material can be used four times on the same work and after use of material credit is given @ 75% of cost</p> <p>Poling boards of</p>				
1198	<p>Second class kail wood in planks</p> <p>$90 \times 0.038 = 3.42$ cum = 3420 cudm</p> <p>qty taken for cost of using once after deducting for credit = $3420 \times 1/4 \times 1/4 = 213.75$ cudm</p> <p>Walings 100 mmx 100 mm of</p>	10 cud m	213.75	260.00	5557.5
1197	<p>Second class kail wood in scantling</p> <p>$4 \times 30 \times 0.10 \times 0.10 = 1.20$ cum = 1200 cudm</p> <p>Qty taken for cost of using once after deducting for credit = $1200 \times 1/4 \times 1/4 = 75$ cudm</p>	10 cud m	75.0	260.00	1950.0

0302	Safeda ballies 125 mm diameter and 1.50m long $2 \times 17 \times 1.50 = 51\text{m}$ Qty taken for cost of using once after deducting for credit= $51 \times 1/4 \times 1/4 = 3.1875\text{m}$ CARRIAGE: Poling boards = 3.42 cum Waling = 1.20 cum Balli struts : $3.14/4 \times (0.125) \times 3 \times 51 = 0.63$ cum Total of carriage = $5.25 \times 4 = 1.3125\text{ cum}$	metre	3.1875	40.00	127.50
2204	Carriage of Timber	cum	1.3125	118.59	155.65
0112	Carpenter 2nd class	Day	0.75	679.00	509.25
0114	Beldar	Day	2.0	558.00	1116.00
9999	Sundries-	L.S	40.43	2.00	80.86

TOTAL					9496.76
Add Water Charges @ 1%					94.97
TOTAL					9591.73
Add CPOH @ 15%					1438.76
TOTAL					11030.49
Cost of 90.0 sqm					11030.49
Cost per sqm					122.56
Say					122.55

Cost index 35.59 %					43.62
Total with Cost index					166.17

14 Specification Code: 2.16.3

2.16 Close timbering in trenches including strutting, shoring and packing cavities

(wherever required) complete (Measurements to be taken of the face area timbered).

2.16.3 Depth exceeding 3 m but not exceeding 4.5 m

Code	Description	Unit	Quantity	Rate	Amount
	<p>Details of cost for a trench 30 m long and 1.5m deep</p> <p>Area = $2 \times 30 \times 1.5 = 90$ sqm.</p> <p>MATERIAL:</p> <p>The Material can be used for times on the same work and after use of material credit is given @ 75% of cost</p> <p>Poling boards of</p>				
1198	<p>Second class kail wood in planks</p> <p>$90 \times 0.038 = 3.42$ cum = 340cudm</p> <p>Qty taken for cost of using once after deducting for credit=$3420 \times 1/4 \times 1/4 = 213.75$ cudm</p> <p>Wallings 100mmx 100mm of</p>	10 cud m	213.75	260.00	5557.5
1197	<p>Second class kail wood in scantling</p> <p>$4 \times 30 \times 0.10 \times 0.10 = 1.20$ cum = 1200 dm3</p> <p>Qty taken for cost of using once after deducting for credit = $1200 \times 1/4 \times 1/4 = 75$ cudm</p>	10 cud m	75.0	260.00	1950.0

0302	Safeda ballies 125 mm diameter and 1.5m long $2 \times 17 \times 1.5 = 51\text{m}$ Qty taken for cost of using once after deducting for credit = $51 \times 1/4 \times 1/4 =$ 3.1875 m CARRIAGE: Poling boards = 3.42 cum Walling - = 1.20 cum. Balli struts: $3.14/4 \times (0.125) 3 \times 51 = 0.63$ cum Total of carriage = $5.25 \times 1/4 = 1.3125$ cum.	metre	3.1875	40.00	127.50
2204	Carriage of Timber LABOUR:	cum	1.3125	118.59	155.65
0112	Carpenter 2nd class	Day	1.5	679.00	1018.50
0114	Beldar	Day	4.0	558.00	2232.00
9999	Sundries-	L.S	80.73	2.00	161.46

Other Engineering Organisations	TOTAL	11202.61
Add Water Charges @ 1%		112.03
TOTAL		11314.64
Add CPOH @ 15%		1697.20
TOTAL		13011.84
Cost of 90.0 sqm		13011.84
Cost per sqm		144.58
Say		144.6

Cost index	35.59 %				51.46
Total with Cost index					196.06

15 Specification Code: od225062/2022_2023

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od225062/2022_2023 :Providing steel sheet shoring to the sides of the trenches to depths of above 4.00 m but not exceeding 6.00m using 6 mm M.S. sheet 0.50 M wide stiffen on edges with 50 mm x 50mm x 6 mm M.S. angles driving down vertically on either side one after another in lines and levels with suitable pile driving equipments and accessories to a maximum depth of 0.50 M below the bottom of the proposed excavation 0.5 M above ground level suitably braced by horizontal walling pieces at 75 x 150 mm x 8 mm angles on either side at intervals not exceeding 1.50M and horizontal screw jack type struts at 1.50M intervals and maintaining the shoring till the pipes are laid and works are completed, dismantling, cleaning and restacking for reuse including all labour, hire charges and conveyance for equipments, tools and plants and sundries etc. complete. (Refernce KWA approved data no.100.6.1)

Code	Description	Unit	Quantity	Rate	Amount
MR	Providing steel sheet shoring to the sides of the trenches to depths of above 4.00 m but not exceeding 6.00m using 6 mm M.S. sheet 0.50 M wide stiffen on edges with 50 mm x 50mm x 6 mm M.S. angles driving down vertically on either side one after another in lines and levels with suitable pile driving equipments and accessories to a maximum depth of 0.50 M below the bottom of the proposed excavation 0.5 M above ground level suitably braced by horizontal walling pieces at 75 x 150 mm x 8 mm angles on either side at intervals not exceeding 1.50M and horizontal screw jack type struts at 1.50M intervals and maintaining the shoring till the pipes are laid and works are completed, dismantling, cleaning and restacking for reuse including all labour, hire charges and conveyance for equipments, tools and plants and sundries etc. complete.	sqm	1.00000	668.87	668.87
TOTAL					668.87
cost for one sqm					668.87
	say				668.87

	Add Water Charges @ 1.0%				6.68
	Add CPOH @ 15.0%				101.33
	Cost index 35.59 %				0.00
	Total with Cost index				776.89

	Say				776.89
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16 Specification Code: 100.7.1

100.7.1

Bailing out water with 5 HP engine and pumpset including conveyance to the site, erection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete.

NEW DATA (Prepared based on PHED SDB - Item No.1070)

Code	Description	Unit	Quantity	Rate	Amount
0011	Hire charges of Pump set of capacity 4000 litres/hour Hire charges of Engine (Per Day) charges for cost of service of operating staff, cost of lubricating oil, diesel / petrol / kerosene oil, other consumables for running the plant and machinery and all the taxes.	Day	1.0	700.00	700.00
TOTAL					700.00
Add Water Charges @ 1%					7.00
TOTAL					707.00
Add CPOH @ 15%					106.05
TOTAL					813.05
Cost of 29.84 Kwh					813.05
Cost per Kwh					27.25
Say					27.25

	Cost index 35.59 %				9.70
	Total with Cost index				36.95

17 Specification Code: 100.7.2

100.7.2

Bailing out water with engine and pumpset above 5 HP upto 10 HP including conveyance to the site, erection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete.
NEW DATA (Prepared based on PHED SDB - Item No.1070)

Code	Description	Unit	Quantity	Rate	Amount
0011	Hire charges of Pump set of capacity 4000 litres/hour Hire charges of Engine (Per Day) charges for cost of service of operating staff, cost of lubricating oil, diesel / petrol / kerosene oil, other consumables for running the plant and machinery and all the taxes.	Day	1.0	700.00	700.00
TOTAL					700.00
Add Water Charges @ 1%					7.00
TOTAL					707.00
Add CPOH @ 15%					106.05
TOTAL					813.05
Cost of 59.68 Kwh					813.05
Cost per Kwh					13.62
Say					13.6

Cost index	35.59 %				4.84
Total with Cost index					18.44

18 Specification Code: 60.2.7

60.2.7

BAILING OUT WATER BY ENGAGING COOLIE - Bailing out water by engaging coolie where ever necessary where pumping with engine and pump set not possible

Code	Description	Unit	Quantity	Rate	Amount
	1 Day				
0115	Coolie	Day	1.0	558.00	558.00
TOTAL					558.00
Add Water Charges @ 1%					5.58
TOTAL					563.58
Add CPOH @ 15%					84.54
TOTAL					648.12
Cost of 1.0 Day					648.12
Cost per Day					648.12
Say					648.1

	Cost index 35.59 %				230.66
	Total with Cost index				878.76

19 Specification Code: od225063/2022_2023

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od225063/2022_2023 :Supply, Delivery and laying of 200mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2) type B. Including Laying dwc pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 200mm nominal outer dia pipes.

Code	Description	Unit	Quantity	Rate	Amount
MR	Cost of 200mm dia ID SN 8 DWC pipe	metre	1.00000	417.00	417.00

MR	Laying pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (excluding cost of pipes and specials). 200 mm nominal outer dia pipes. GWSSB SOR 22-23	metre	1.00000	33.00	33.00
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TOTAL					450.00
cost for one metre					450.00
	say				450.00

	Add Water Charges @ 1.0%				4.50
	Add CPOH @ 15.0%				68.17
	Cost index 35.59 %				0.00
	Total with Cost index				522.68
	Say				522.67

20 Specification Code: od234719/2022_2023

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od234719/2022_2023 :Supply, Delivery and laying of 250mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2) type B. Including Laying dwc pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 250mm nominal outer dia pipes.

Code	Description	Unit	Quantity	Rate	Amount
MR	Cost of 250mm dia ID SN 8 DWC pipe (Rate taken from TWAD SoR 21-22)	metre	1.00000	680.00	680.00

MR	Laying UPVC pipes of class 2 to class 6 and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (excluding cost of pipes and specials). 250 mm nominal outer dia pipes. GWSSB SOR 22-23	metre	1.00000	42.00	42.00
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TOTAL					722.00
cost for one metre					722.00
	say				722.00

	Add Water Charges @ 1.0%				7.22
	Add CPOH @ 15.0%				109.38
	Cost index 35.59 %				0.00
	Total with Cost index				838.60
	Say				838.60

21 Specification Code: od225065/2022_2023

od225065/2022_2023 :Supply, Delivery and laying of 300mm dia ID SN 8 pipe DWC Structured Wall Polyethylene Piping Systems (Pipe with online/offline electrofusion coupler and elastomeric sealing ring) with required specials non-smooth external annular corrugated and smooth internal surface (Double wall) (SN 8 Class) for non-pressure underground sewerage, drainage application generally as per IS-16098 (Part-2)type B. Including all local and central taxes, transportation freight charges, inspection charges, loading and unloading, conveyance etc. Including lowering Laying dwc pipes and specials, lowering to the trenches already made , placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 300mm nominal outer dia pipes.

Code	Description	Unit	Quantity	Rate	Amount
MR	Cost of 300mm dia ID SN 8 DWC pipe (Rate taken from TWAD SoR 21-22)	metre	1.00000	915.00	915.00
MR	lowering Laying dwc pipes Gujarat SoR 21-22)	metre	1.00000	62.00	62.00
TOTAL					977.00

cost for one metre					977.00
	say				977.00

	Add Water Charges @ 1.0%				9.77
	Add CPOH @ 15.0%				148.01
	Cost index 35.59 %				0.00
	Total with Cost index				1134.79
	Say				1134.79

22 Specification Code: od234823/2022_2023

od234823/2022_2023 :Supplying conveying and laying pipes and specials ISI marked 400mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.

Electrofusion cou[ler for 1 pipe of 6m = Rs 2000 (MR) For taking RATE of pipe work per meter cost of coupler is taken as $5000/6=833.33$ say 835.00

Code	Description	Unit	Quantity	Rate	Amount
MR	Cost of 315mm dia PN8 PE 100 sewer pipes (REF 100.98.146)	per metre	1.00000	6806.14	6806.14
MR	Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings. (KWA 100.9.13)	per metre	1.00000	367.90	367.90

MR	Electrofusion coupler (1/6 the cost of one coupler)	each	1.00000	535.00	535.00
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TOTAL					7709.04
cost for one per metre					7709.04
	say				7709.04

	Add Water Charges @ 1.0%				77.09
	Add CPOH @ 15.0%				1167.91
	Cost index 35.59 %				0.00
	Total with Cost index				8954.05
	Say				8954.05

23 Specification Code: od225069/2022_2023

od225069/2022_2023 :Suupplying conveying and laying pipes and specials ISI marked 450mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydrulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.

Electrofusion cou[ler for 1 pipe of 6m = Rs 3100 (MR) For taking RAte of pipe work per meter cost of coupler is taken as $3100/6=516.67$ say 520

Code	Description	Unit	Quantity	Rate	Amount
MR	Cost of 450mm dia PN8 PE 100 sewer pipes (KWA.98.147)	per metre	1.00000	7914.62	7914.62

MR	Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings. (KWA 100.10.11	metre	1.00000	407.60	407.60
MR	Electrofusion coupler (1/6 the cost of one coupler)	each	1.00000	700.00	700.00

TOTAL					9022.22
cost for one per metre					9022.22
	say				9022.22

	Add Water Charges @ 1.0%				90.22
	Add CPOH @ 15.0%				1366.86
	Cost index 35.59 %				0.00
	Total with Cost index				10479.31
	Say				10479.31

24 Specification Code: od225070/2022_2023

od225070/2022_2023 :Supplying conveying and laying pipes and specials ISI marked 500 mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.

Electrofusion cou[ler for 1 pipe of 6m = Rs 3100 (MR) For taking RAte of pipe work per meter cost of coupler is taken as $3100/6=516.67$ say 520

Code	Description	Unit	Quantity	Rate	Amount
MR	PE Pipe, PE100, PN8, 500mm dia, conforming to IS 4984/2016 (Ref 100.98.148)	metre	1.00000	10082.40	10082.40
MR	Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings. (KWA 100.10.15	per metre	1.00000	893.54	893.54
MR	Electrofusion coupler (1/6 the cost of one coupler)	each	1.00000	1100.17	1100.17
TOTAL					12076.11
cost for one per metre					12076.11
	say				12076.11

	Add Water Charges @ 1.0%				120.76
	Add CPOH @ 15.0%				1829.53
	Cost index 35.59 %				0.00
	Total with Cost index				14026.40
	Say				14026.40

25 Specification Code: od235029/2022_2023

od235029/2022_2023 :Supplying conveying and laying pipes and specials ISI marked 560 mm dia HDPE pipes having PE8, PE100 including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back

filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.

Electrofusion coupler for 1 pipe of 6m = Rs 3100 (MR) For taking Rate of pipe work per meter cost of coupler is taken as $3100/6=516.67$ say 520

Code	Description	Unit	Quantity	Rate	Amount
MR	PE Pipe, PE100, PN8, 560mm dia, conforming to IS 4984/2016 (Ref 100.98.149)	metre	1.00000	12622.49	12622.49
MR	Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings. (KWA 100.10.16)	per metre	1.00000	985.40	985.40
MR	Electrofusion coupler (1/6 the cost of one coupler)	each	1.00000	520.00	520.00
TOTAL					14127.89
cost for one per metre					14127.89
	say				14127.89

	Add Water Charges @ 1.0%				141.27
	Add CPOH @ 15.0%				2140.37
	Cost index 35.59 %				0.00
	Total with Cost index				16409.54
	Say				16409.54

26 Specification Code: od234982/2022_2023

od234982/2022_2023 :Supplying conveying and laying pipes and specials ISI marked 630 mm dia HDPE

pipes having PE8, PE100 including conveyance charges to stock yard , unloading charges, freight charges, taxes if any,Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings.

Electrofusion coupler for 1 pipe of 6m = Rs 3100 (MR) For taking Rate of pipe work per meter cost of coupler is taken as $3100/6=516.67$ say 520

Code	Description	Unit	Quantity	Rate	Amount
MR	PE Pipe, PE100, PN8, 630mm dia, conforming to IS 4984/2016 (Ref 100.98.150)	metre	1.00000	15960.33	15960.33
MR	Laying HDPE pipes on land portion including conveying within initial lead and aligning the pipes, electro-fusion welding using automatic or semi automatic electrofusion machines, testing the pipe line thus fabricated to suit the hydraulic working pressure and after testing , aligning the pipeline, lowering the pipe in position into the trenches already made, testing the line to suitable pressure with potable water before back filling and leveling the trenches including all labour charge, hire for appliances etc. complete including cost of pipe ,electrofusion couplers and fittings. (KWA 100.10.17)	per metre	1.00000	1095.43	1095.43
MR	Electrofusion coupler (1/6 the cost of one coupler)	each	1.00000	520.00	520.00
TOTAL					17575.76
cost for one per metre					17575.76
	say				17575.76

	Add Water Charges @ 1.0%				175.75
	Add CPOH @ 15.0%				2662.72
	Cost index 35.59 %				0.00
	Total with Cost index				20414.25
	Say				20414.25

27 Specification Code: 7.1.1

7.1 Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with:

7.1.1 Cement mortar 1:6 (1 cement : 6 coarse sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL				
1157	Stone for masonry work	cum	1.0	1100.00	1100.00
1154	Through and bond stone size 24 x 24 x 39cm CARRIAGE:	100 nos	7.0	5000.00	350.0
2215	Carriage of Soling stone & masonry stone 7.00x24cmx39cm = 0.16 cum 1.00 cum + 0.16 cum. = 1.16 cum Cement mortar 1:6 (1 cement : 6 Coarse sand)	cum	1.16	122.08	141.61
3.11	Rate as per item Number 3.11 of SH: Mortars LABOUR:	cum	0.33	3356.15	1107.53
0125	Mason (for plain stone work) 2nd class	Day	1.07	679.00	726.53
0114	Beldar	Day	1.07	558.00	597.06
0115	Coolie	Day	0.71	558.00	396.18
0101	Bhisti	Day	0.09	617.00	55.53
9999	Sundries-Cement concrete 1:6:12	L.S	45.76	2.00	91.52
9999	Sundries-	L.S	4.42	2.00	8.84
TOTAL					4574.80
Add Water Charges @ 1%					45.75
TOTAL					4620.55

Add CPOH @ 15%	693.08
TOTAL	5313.63
Cost of 1.0 cum	5313.63
Cost per cum	5313.63
Say	5313.65

Cost index 35.59 %	1891.13
Total with Cost index	7204.78

28 Specification Code: od225083/2022_2023

**od225083/2022_2023 :Random rubble masonry with hard stone in foundation and plinth including levelling up with cement concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plinth level with:
Cement mortar 1:6 (1 cement : 6 coarse sand) excluding cost of rubble. Rubble can be taken from the stacked qty obtained from dismantled work**
 Details of cost for 1 cum
 MATERIAL

Code	Description	Unit	Quantity	Rate	Amount
1154	Through and bond stone size 24 x 24 x 39cm CARRIAGE:	100 nos	7.00000	5000.00	350.00
2215	Soling stone & masonry stone 7.00x24cmx39cm = 0.16 cum 1.00 cum + 0.16 cum. = 1.16 cum Cement mortar 1:6 (1 cement : 6 Coarse sand)	cum	1.16000	122.08	141.61
3.11	Rate as per item number3.11of SH:Mortars LABOUR:	cum	0.33000	3356.15	1107.53
0125	Mason (for plain stone work) 2nd class 	Day	1.07000	679.00	726.53
0114	Beldar 	Day	1.07000	558.00	597.06
0115	Coolie 	Day	0.71000	558.00	396.18
0101	Bhisti 	Day	0.09000	617.00	55.53
9999	Sundries Cement concrete 1:6:12	L.S	45.76000	2.00	91.52
9999	Sundries 	L.S	4.42000	2.00	8.84

TOTAL					3474.80
cost for one cum					3474.80
	say				3474.80

	Add Water Charges @ 1.0%				34.74
	Add CPOH @ 15.0%				526.43
	Cost index 35.59 %				1436.40
	Total with Cost index				5472.39
	Say				5472.39

29 Specification Code: od225085/2022_2023

od225085/2022_2023 :construction of precast drain and cover slab, including cost of, concrete, centering and shuttering, reinforcements, and all other allied activities in including all tools and plants as per the requirements of the Engineer in charge as per the drawings

Rate analysis carried out for 10m length precast drain for the drawing attached

Code	Description	Unit	Quantity	Rate	Amount
5.2.2	Rate as per item number 5.2.2 of SH: Reinforced Cement Concrete	cum	5.00000	6955.49	34777.44
5.9.2	Rate as per item number 5.9.2 of SH: Reinforced Cement Concrete	sqm	56.00000	455.40	25502.54
5.22A.6	Rate as per item number 5.22A.6 of SH: Reinforced Cement Concrete	kg	410.00000	62.42	25591.91
TOTAL					85871.89
	cost for 10.0 cum				85871.89
	cost for one cum				8587.19
	say				8587.19

	Add Water Charges @ 1.0%				85.87
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	Add CPOH @ 15.0%				1300.95
	Cost index 35.59 %				3549.75
	Total with Cost index				13523.78
	Say				13523.78

30 Specification Code: 16.68

16.68

Providing and laying 60 mm thick factory made cement concrete interlocking paver block of M - 30 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost of 10 sqm MATERIAL:				
8689	Interlocking C.C. paver block (60 mm thick, M-30) Bedding Layer 50 mm thick	sqm	10.0	400.00	4000.00
0982	Coarse sand (zone III) = 10x0.050 = 0.50 cum	cum	0.5	1350.00	675.00
2203	Carriage of Coarse sand	cum	0.5	103.77	51.89
0983	Fine sand (zone IV)	cum	0.15	900.00	135.00
2261	Carriage of Fine sand (1 part badarpur sand : 2 parts jamuna sand Laying charges (Based on actual observation)	cum	0.15	103.77	15.57
0123	Mason (brick layer) 1st class	Day	0.5	738.00	369.00
0124	Mason (brick layer)2nd class	Day	0.5	679.00	339.50
0114	Beldar	Day	1.0	558.00	558.00

0115	Coolie	Day	0.5	558.00	279.00
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TOTAL					6422.96
Add Water Charges @ 1%					64.23
TOTAL					6487.19
Add CPOH @ 15%					973.08
TOTAL					7460.27
Cost of 10.0 sqm					7460.27
Cost per sqm					746.03
Say					746.05

Cost index 35.59 %					265.52
Total with Cost index					1011.57

31 Specification Code: 16.84

16.84

Laying old cement concrete interlocking paver blocks of any design/ shape laid in required line, level, curvature, colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge. (Old CC paver blocks shall be supplied by the department free of cost.)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Beading layer 50mm thick				
0982	Coarse sand (zone III) Qty = 10x 0.05 = 0.50 cum	cum	0.5	1350.00	675.00
2203	Carriage of Coarse sand	cum	0.5	103.77	51.89
0983	Fine sand (zone IV)	cum	0.15	900.00	135.00

2261	Carriage of Fine sand (1 part badarpur sand : 2 parts jamuna sand LABOUR:	cum	0.15	103.77	15.57
0123	Mason (brick layer) 1st class	Day	0.5	738.00	369.00
0124	Mason (brick layer)2nd class	Day	0.5	679.00	339.50
0114	Beldar	Day	1.0	558.00	558.00
0115	Coolie	Day	0.5	558.00	279.00

TOTAL	2422.96
Add Water Charges @ 1%	24.23
TOTAL	2447.19
Add CPOH @ 15%	367.08
TOTAL	2814.27
Cost of 10.0 sqm	2814.27
Cost per sqm	281.43
Say	281.45

Cost index	35.59 %	100.17
Total with Cost index		381.62

32 Specification Code: od225086/2022_2023

od225086/2022_2023 :Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge

Details of cost for 10 cum

MATERIAL:

Code	Description	Unit	Quantity	Rate	Amount
0982	Coarse sand (zone III)	cum	2.50000	1350.00	3375.00

2203	Coarse sand	cum	2.50000	103.77	259.43
0296	Stone Aggregate(single size): 12.5 mm nominal size	cum	7.50000	1350.00	10125.00
2202	Stone aggregate below 40 mm nominal size	cum	7.50000	103.77	778.28
0114	Beldar 	Day	0.89000	558.00	496.62
0115	Coolie 	Day	1.07000	558.00	597.06
0101	Bhisti	Day	0.89000	617.00	549.13

TOTAL					16180.52
	cost for 10.0 cum				16180.52
	cost for one cum				1618.05
	say				1618.05

	Add Water Charges @ 1.0%				16.18
	Add CPOH @ 15.0%				245.13
	Cost index 35.59 %				668.86
	Total with Cost index				2548.23
	Say				2548.23

33 Specification Code: od225087/2022_2023

od225087/2022_2023 :Supplying and filling in plinth with Stone dust under floors, including watering, ramming consolidating and dressing complete.

Details of cost for 10 cum

MATERIAL:

Code	Description	Unit	Quantity	Rate	Amount
1159	Stone dust	cum	10.00000	1100.00	11000.00
2267	Stone dust	cum	10.00000	103.77	1037.70
0114	Beldar 	Day	0.89000	558.00	496.62
0115	Coolie 	Day	1.07000	558.00	597.06

0101	Bhisti 	Day	0.35000	617.00	215.95
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TOTAL					13347.33
	cost for 10.0 cum				13347.33
	cost for one cum				1334.73
	say				1334.73

	Add Water Charges @ 1.0%				13.34
	Add CPOH @ 15.0%				202.21
	Cost index 35.59 %				551.74
	Total with Cost index				2102.04
	Say				2102.04

Construction of RCC M30 Concrete Manholes of 1.2m and 1.5m diameter using sulphate resistant Cement and corrosion resistant steel reinforcement for Elamkulam sewer network system

1 Specification Code: od238490/2022_2023

od238490/2022_2023 :Construction of manhole of 1.2m diameter for an average depth of 1.3m (depth up to 1.5m) including, earth work in excavation by mechanical means of depth 0-1.5m including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter. R1

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	9.56000	135.90	1299.22
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	4.06000	164.18	666.59

MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	0.80000	2548.23	2038.58
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.80000	4678.17	3742.54
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	1.94000	5977.31	11595.99
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	155.20000	62.42	9687.47
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	0.85000	212.91	180.98
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	12.33000	412.61	5087.52
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.22000	4678.17	1029.20
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	1.94000	2247.40	4359.96
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	6.21000	141.80	880.57
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	6.53000	124.50	812.99
MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	9.42000	24.12	227.21
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	1.94000	52.13	101.13

TOTAL					44578.95
cost for one no					44578.95
	say				44578.95

	Add Water Charges @ 1.0%				445.78
	Add CPOH @ 15.0%				6753.71

	Cost index 35.59 %				14166.95
	Total with Cost index				65945.41
	Say				65945.41

2 Specification Code: od238621/2022_2023

od238621/2022_2023 :Construction of manhole of 1.2m diameter for an average depth of 1.75m (depth 1.5m to 3m) including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter. R1

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	7.96000	135.90	1081.78
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	5.54000	164.18	909.58
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	0.80000	2548.23	2038.58
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.80000	4678.17	3742.54
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	2.33000	5977.31	13927.14
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	186.40000	62.42	11634.95

4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	0.85000	212.91	180.98
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	16.28000	412.61	6717.34
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.22000	4678.17	1029.20
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	2.33000	2247.40	5236.44
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	7.46000	141.80	1057.82
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	8.80000	124.50	1095.60
MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	9.42000	24.12	227.21
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	2.33000	52.13	121.46
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	6.03000	67.54	407.28

Other Engineering Organisations				TOTAL	52276.90
PR				cost for one no	52276.91
say					52276.91

	Add Water Charges @ 1.0%				522.76
	Add CPOH @ 15.0%				7919.95
	Cost index 35.59 %				16869.97
	Total with Cost index				77589.61
	Say				77589.61

3 Specification Code: od238941/2022_2023

od238941/2022_2023 :Construction of manhole of 1.5m diameter for an average depth of 4.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.R1

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	34.28000	135.90	4658.72
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	16.66000	164.18	2735.31
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.06000	2548.23	2701.12
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	1.06000	4678.17	4958.87
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	7.50000	5977.31	44829.85
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	600.00000	62.42	37451.57
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	1.49000	212.91	317.24
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	48.43000	412.61	19982.85
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.35000	4678.17	1637.36
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	7.50000	2247.40	16855.50
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	24.00000	141.80	3403.19
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00

MR	Anticorrosive bituminous paint-outside	sqm	26.70000	124.50	3324.15
MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	10.68000	24.12	257.60
2.16.1	Rate as per item number 2.16.1 of SH: Earth Work	sqm	14.14000	97.12	1373.22
2.16.2	Rate as per item number 2.16.2 of SH: Earth Work	sqm	14.14000	105.51	1491.91
2.16.3	Rate as per item number 2.16.3 of SH: Earth Work	sqm	11.78000	124.49	1466.54
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	7.50000	52.13	390.98
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	23.68000	67.54	1599.39
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	13.08300	67.54	883.65
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	2.48300	67.54	167.71

TOTAL					153355.73
cost for one no					153355.73
	say				153355.73

	Add Water Charges @ 1.0%				1533.55
	Add CPOH @ 15.0%				23233.39
	Cost index 35.59 %				52642.98
	Total with Cost index				230765.67
	Say				230765.67

4 Specification Code: od238942/2022_2023

od238942/2022_2023 :Construction of manhole of 1.2m diameter for an average depth of 2.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling,

manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.2m diameter.R2

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	19.71000	135.90	2678.63
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	7.65000	164.18	1256.01
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	0.86000	2548.23	2191.48
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.86000	4678.17	4023.23
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	3.59000	5977.31	21458.56
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	287.20000	62.42	17926.82
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	0.85000	212.91	180.98
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	21.78000	412.61	8986.71
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.22000	4678.17	1029.20
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	3.59000	2247.40	8068.17
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	11.49000	141.80	1629.28
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	12.02000	124.50	1496.49

MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	9.42000	24.12	227.21
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	3.59000	52.13	187.15
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	11.12000	67.54	751.07

TOTAL					74959.99
cost for one no					74959.96
	say				74959.96

	Add Water Charges @ 1.0%				749.59
	Add CPOH @ 15.0%				11356.43
	Cost index 35.59 %				24847.15
	Total with Cost index				111913.15
	Say				111913.15

5 Specification Code: od238980/2022_2023

od238980/2022_2023 :Construction of manhole of 1.5m diameter for an average depth of 3.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter. R1

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	26.86000	135.90	3650.32
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	12.62000	164.18	2072.01
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.06000	2548.23	2701.12
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	1.06000	4678.17	4958.87
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	5.89000	5977.31	35206.38
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	471.20000	62.42	29411.97
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	1.49000	212.91	317.24
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	37.06000	412.61	15291.44
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.35000	4678.17	1637.36
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	5.89000	2247.40	13237.19
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	18.85000	141.80	2672.92
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour charges etc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	20.42000	124.50	2542.29
MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	10.68000	24.12	257.60
2.16.1	Rate as per item number 2.16.1 of SH: Earth Work	sqm	14.14000	97.12	1373.22
2.16.2	Rate as per item number 2.16.2 of SH: Earth Work	sqm	14.14000	105.51	1491.91
2.16.3	Rate as per item number 2.16.3 of SH: Earth Work	sqm	2.36000	124.49	293.81
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	5.89000	52.13	307.05
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	16.26000	67.54	1098.23

2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	5.66000	67.54	382.29
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TOTAL					121772.22
cost for one no					121772.21
	say				121772.21

	Add Water Charges @ 1.0%				1217.72
	Add CPOH @ 15.0%				18448.48
	Cost index 35.59 %				41405.99
	Total with Cost index				182844.4 2
	Say				182844.4 2

6 Specification Code: od238931/2022_2023

Other Engineering Organisations

od238931/2022_2023 :Construction of manhole of 1.5m diameter for an average depth of 3.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.R1

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	30.39000	135.90	4130.06
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	14.58000	164.18	2393.81

MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.06000	2548.23	2701.12
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	1.06000	4678.17	4958.87
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	6.58000	5977.31	39330.72
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	526.40000	62.42	32857.51
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	1.49000	212.91	317.24
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	42.55000	412.61	17556.68
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.35000	4678.17	1637.36
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	6.58000	2247.40	14787.89
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	21.06000	141.80	2986.30
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	23.56000	124.50	2933.22
MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	10.68000	24.12	257.60
2.16.1	Rate as per item number 2.16.1 of SH: Earth Work	sqm	14.14000	97.12	1373.22
2.16.2	Rate as per item number 2.16.2 of SH: Earth Work	sqm	14.14000	105.51	1491.91
2.16.3	Rate as per item number 2.16.3 of SH: Earth Work	sqm	7.07000	124.49	880.17
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	19.79000	67.54	1336.66
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	9.19000	67.54	620.71
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	6.58000	52.13	343.02

TOTAL				135763.07
cost for one no				135763.08

	say				135763.08
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	Add Water Charges @ 1.0%				1357.63
	Add CPOH @ 15.0%				20568.10
	Cost index 35.59 %				46386.88
	Total with Cost index				204075.70
	Say				204075.70

7 Specification Code: od238909/2022_2023

od238909/2022_2023 :Construction of manhole of 1.5m diameter for an average depth of 2.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter. R1

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	28.92000	135.90	3930.28
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	10.65000	164.18	1748.56
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.06000	2548.23	2701.12

4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	1.06000	4678.17	4958.87
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	5.20000	5977.31	31082.03
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	416.00000	62.42	25966.42
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	1.49000	212.91	317.24
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	31.56000	412.61	13022.07
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.35000	4678.17	1637.36
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	5.20000	2247.40	11686.48
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	16.64000	141.80	2359.54
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	17.28000	124.50	2151.36
MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	5.20000	52.13	271.08
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	18.32000	67.54	1237.37

TOTAL					106196.38
cost for one no					106196.39
	say				106196.39

	Add Water Charges @ 1.0%				1061.96
	Add CPOH @ 15.0%				16088.75
	Cost index 35.59 %				35769.92
	Total with Cost index				159117.03

	Say				159117.0 3
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8 Specification Code: od238960/2022_2023

od238960/2022_2023 :Construction of manhole of 1.5m diameter for an average depth of 4.75m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter.R1

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	37.82000	135.90	5139.81
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	18.63000	164.18	3058.75
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.06000	2548.23	2701.12
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	1.06000	4678.17	4958.87
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	8.18000	5977.31	48894.43
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	654.40000	62.42	40847.18
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	1.49000	212.91	317.24
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	53.93000	412.61	22252.22
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.35000	4678.17	1637.36

MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	8.18000	2247.40	18383.73
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	26.18000	141.80	3712.31
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour charges etc complete	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	29.85000	124.50	3716.33
MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	10.68000	24.12	257.60
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	44.77000	121.48	5438.70
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	8.18000	52.13	426.43
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	27.22000	67.54	1838.49
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	16.62000	67.54	1122.55
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	6.02000	67.54	406.60

TOTAL				167978.72
cost for one no				167978.72
say				167978.72

	Add Water Charges @ 1.0%				1679.78
	Add CPOH @ 15.0%				25448.77
	Cost index 35.59 %				57893.95
	Total with Cost index				253001.24
	Say				253001.24

9 Specification Code: od238982/2022_2023

od238982/2022_2023 :Construction of manhole of 1.5m diameter for an average depth of 5.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 1.5m diameter. R2

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	41.35000	135.90	5619.54
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	20.59000	164.18	3380.55
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.06000	2548.23	2701.12
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	1.06000	4678.17	4958.87
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	8.87000	5977.31	53018.77
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	709.60000	62.42	44292.72
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	1.49000	212.91	317.24
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	59.43000	412.61	24521.59
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	0.35000	4678.17	1637.36
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	8.87000	2247.40	19934.44
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	28.38000	141.80	4024.27
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complet. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	32.99000	124.50	4107.26

MR	Fencing one side of trenches, 1.50 m height with two rows of 10 cm plastic caution tape in vertical casuarina pole (girth 15cm to 24cm) fixed at 2 m intervals. (Data Prepared based on PWD SDB - Item No.1009) (Refere KWA data 100.8.1) 	metre	10.68000	24.12	257.60
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	49.48000	121.48	6010.87
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	30.75100	67.54	2076.98
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	20.15000	67.54	1360.97
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	9.55000	67.54	645.03
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	8.87000	52.13	462.40

TOTAL					182196.58
cost for one no					182196.59
	say				182196.59

	Add Water Charges @ 1.0%				1821.96
	Add CPOH @ 15.0%				27602.78
	Other Engineering Organisations Cost index 35.59 %				62968.67
	Total with Cost index				274590.0 2
	Say				274590.0 2

Construction of RCC M30 Concrete Lift manholes of 2.5m diameter lift manholes for Elamkulam sewer network system
1 Specification Code: od225041/2022_2023

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od225041/2022_2023 :Construction of manhole of 2.5m diameter for an average depth of 5.35m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing

position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	78.56000	135.90	10676.30
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	29.91000	164.18	4910.62
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.98000	2548.23	5045.50
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	3.96000	4678.17	18525.55
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	18.17000	5977.31	108607.72
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1454.00000	62.42	90758.68
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	4.63000	212.91	985.77
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	95.92000	412.61	39577.55
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	18.17000	2247.40	40835.26
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	58.14000	141.80	8244.25
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	52.10000	124.50	6486.45
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	80.50000	121.48	9779.14

MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	18.17000	52.13	947.20
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	58.72000	67.54	3965.95
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	38.92700	67.54	2629.13
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	19.13400	67.54	1292.31

TOTAL					356393.98
cost for one no					356394.00
	say				356394.00

	Add Water Charges @ 1.0%				3563.94
	Add CPOH @ 15.0%				53993.69
	Cost index 35.59 %				85160.86
	Other Engineering Organisations Total with Cost index				499112.49
	Say				499112.49

2 Specification Code: od225044/2022_2023

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od225044/2022_2023 :Construction of manhole of 3.5m diameter for an average depth of 5m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset

including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	109.96000	135.90	14943.56
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	34.91000	164.18	5731.52
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	2.95000	2548.23	7517.28
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	5.90000	4678.17	27601.20
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	21.62000	5977.31	129229.44
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1729.60000	62.42	107961.63
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	9.34000	212.91	1988.58
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	119.70000	412.61	49389.42
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	21.62000	2247.40	48588.79
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	69.18000	141.80	9809.72
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	62.83000	124.50	7822.34
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	98.17000	121.48	11925.69
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	21.62000	52.13	1127.05

2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	80.46000	67.54	5434.27
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	51.02500	67.54	3446.23
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	21.58000	67.54	1457.51

TOTAL					437100.83
cost for one no					437100.84
	say				437100.84

	Add Water Charges @ 1.0%				4371.00
	Add CPOH @ 15.0%				66220.77
	Cost index 35.59 %				103986.1 2
	Total with Cost index				611678.7 5
	Say				611678.7 5

Other Engineering Organisations

3 Specification Code: od225047/2022_2023

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od225047/2022_2023 :Construction of manhole of 2.5m diameter for an average depth of 6.13m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.50m diameter.

Code	Description	Unit	Quantity	Rate	Amount
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2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	88.90000	135.90	12081.51
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	34.30000	164.18	5631.37
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.98000	2548.23	5045.50
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	3.96000	4678.17	18525.55
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	20.20000	5977.31	120741.66
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1618.00000	62.42	100995.56
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	4.63000	212.91	985.77
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	110.00000	412.61	45387.10
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	20.20000	2247.40	45397.48
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	64.70000	141.80	9174.46
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	59.70000	124.50	7432.65
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	80.50000	121.48	9779.14
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	20.20000	52.13	1053.03
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	69.01000	67.54	4660.94
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	49.22000	67.54	3324.32
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	29.42600	67.54	1987.43
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	9.63200	67.54	650.56

TOTAL				395980.63
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cost for one no					395980.64
	say				395980.64

	Add Water Charges @ 1.0%				3959.80
	Add CPOH @ 15.0%				59991.06
	Cost index 35.59 %				93002.65
	Total with Cost index				552934.17
	Say				552934.17

4 Specification Code: od225049/2022_2023

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Other Engineering Organisations

od225049/2022_2023 :Construction of manhole of 3m diameter for an average depth of 6.25m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	113.84000	135.90	15470.86
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	39.86000	164.18	6544.21

MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	2.49000	2548.23	6345.09
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	4.98000	4678.17	23297.29
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	24.90000	5977.31	148835.02
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1992.0000 0	62.42	124340.64
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	6.79000	212.91	1445.66
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	131.48000	412.61	54249.96
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	24.90000	2247.40	55960.26
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	79.68000	141.80	11298.62
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	70.69000	124.50	8800.91
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	90.32000	121.48	10972.07
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	24.90000	52.13	1298.04
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	88.86000	67.54	6001.60
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	63.95000	67.54	4319.18
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	39.03400	67.54	2636.36
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	14.11900	67.54	953.63

TOTAL					485896.00
cost for one no					485896.00
	say				485896.00

	Add Water Charges @ 1.0%				4858.96
	Add CPOH @ 15.0%				73613.24
	Cost index 35.59 %				114996.0 0
	Total with Cost index				679364.2 0
	Say				679364.2 0

5 Specification Code: od225051/2022_2023

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od225051/2022_2023 :Construction of manhole of 2.5m diameter for an average depth of 4.99m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	70.25000	135.90	9546.98
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	27.11000	164.18	4450.92
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.88000	2548.23	4790.67
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	3.76000	4678.17	17589.92

5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	14.66000	5977.31	87627.36
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1172.8000 0	62.42	73206.18
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	4.63000	212.91	985.77
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	87.93000	412.61	36280.80
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	14.66000	2247.40	32946.88
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	46.91000	141.80	6651.84
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour charges etc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	47.03000	124.50	5855.24
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	78.54000	121.48	9541.04
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	14.66000	52.13	764.23
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	51.49600	67.54	3478.04
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	32.65600	67.54	2205.59
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	13.81600	67.54	933.13

TOTAL					299981.19
cost for one no					299981.18
	say				299981.18

	Add Water Charges @ 1.0%				2999.81
	Add CPOH @ 15.0%				45447.14
	Cost index 35.59 %				69429.81
	Total with Cost index				417857.9 5

	Say				417857.95
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6 Specification Code: od225053/2022_2023

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od225053/2022_2023 :Construction of manhole of 2.5m diameter for an average depth of 5.51m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	80.67000	135.90	10963.05
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	30.81000	164.18	5058.39
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.98000	2548.23	5045.50
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	3.96000	4678.17	18525.55
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	18.59000	5977.31	111118.19
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1487.20000	62.42	92831.02
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	4.63000	212.91	985.77

5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	98.74000	412.61	40741.11
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	18.59000	2247.40	41779.17
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	59.49000	141.80	8435.68
MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour chargesetc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	53.66000	124.50	6680.67
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	80.50000	121.48	9779.14
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	18.59000	52.13	969.10
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	60.83000	67.54	4108.46
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	41.03900	67.54	2771.77
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	21.24000	67.54	1434.55
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	1.45000	67.54	97.93

PRICE TOTAL					364451.65
cost for one no					364451.66
	say				364451.66

	Add Water Charges @ 1.0%				3644.51
	Add CPOH @ 15.0%				55214.42
	Cost index 35.59 %				86785.96
	Total with Cost index				510096.57
	Say				510096.57

7 Specification Code: od225054/2022_2023

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od225054/2022_2023 :Construction of manhole of 2.5m diameter for an average depth of 6.01m including, earth work in excavation by mechanical means including disposal of earth, extra cost for under water excavation for all leads and lifts, backfilling, supplying and filling sand gravel mix under PCC, providing position placed cement concrete mix of M-1:3:6 under base slab, RCC of M30 for benching and channeling, manhole base slab, side walls, with sulphate resistant cement upto plinth level, centering and shuttering works upto plinth level, steel works including painting with epoxy paint on steel works, inside plastering of 12mm thick, 1:3 mix with neat cement, painting two or more coats with anticorrosive bituminous paint to the outer surfaces, supply and laying of SFRC manhole cover of 600mm diameter, de-watering with 5 HP engine and pumpset including conveyance, erection, dismantling and tacking back, cost of fuel lubricating oil and other stores, side protection with close timbering, provision of pipe connection for inlet, outlet and service connection pipes, providing danger lights, barricades etc.all leads and lifts as directed etc. complete. For 2.5m diameter.

Code	Description	Unit	Quantity	Rate	Amount
2.6.1	Rate as per item number 2.6.1 of SH: Earth Work	cum	87.27000	135.90	11859.99
2.25	Rate as per item number 2.25 of SH: Earth Work	cum	33.64000	164.18	5523.02
MR	Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	sqm	1.98000	2548.23	5045.50
4.1.5	Rate as per item number 4.1.5 of SH: Concrete work	cum	3.96000	4678.17	18525.55
5.33.1	Rate as per item number 5.33.1 of SH: Reinforced Cement Concrete	cum	19.91000	5977.31	119008.24
5.22.6	Rate as per item number 5.22.6 of SH: Reinforced Cement Concrete	kilogram	1592.80000	62.42	99422.58
4.3.1	Rate as per item number 4.3.1 of SH: Concrete work	sqm	4.63000	212.91	985.77
5.9.5	Rate as per item number 5.9.5 of SH: Reinforced Cement Concrete	sqm	107.54000	412.61	44372.08
MR	Extra for providing sulphate resistant cement for the structures above plinth level. 	cum	19.91000	2247.40	44745.73
13.52.1	Rate as per item number 13.52.1 of SH: Finishing	sqm	63.71000	141.80	9034.08

MR	Supplying and fixing 600mm dia SFRC manhole cover with frame(medium duty) charges including all cost, labour charges etc complete. 	no	1.00000	2869.00	2869.00
MR	Anticorrosive bituminous paint-outside	sqm	63.05000	124.50	7849.73
2.17.2	Rate as per item number 2.17.2 of SH: Earth Work	sqm	58.53000	121.48	7110.22
MR	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	metre	10.68000	24.12	257.60
5.34.1	Rate as per item number 5.34.1 of SH: Reinforced Cement Concrete	cum	19.91000	52.13	1037.91
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	67.43000	67.54	4554.22
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	47.63000	67.54	3216.93
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	27.84300	67.54	1880.52
2.26.1	Rate as per item number 2.26.1 of SH: Earth Work	cum	8.04900	67.54	543.63

TOTAL					387842.30
cost for one no					387842.30
	say				387842.30

	Add Water Charges @ 1.0%				3878.42
	Add CPOH @ 15.0%				58758.10
	Cost index 35.59 %				91972.94
	Total with Cost index				542451.77
	Say				542451.77

8 Specification Code: od235042/2022_2023

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od235042/2022_2023 :Providing nonclog submercible pumpset of suitable capacity (5 HP) in lift manholes/

lifting stations for lifting and conveying the sewer load to the nearest manholes including pumping main of suitable size electrical installations such as cables, switch boxes, MCC panels, isolators, float switches etc complete necessary for functioning of lifting stations all as directed by Engineer in charge. (For Elamkulam STP)

Code	Description	Unit	Quantity	Rate	Amount
MR	Providing nonclog submercible pumpset of suitable capacity (5 HP) in lift manholes/ lifting stations for lifting and conveying the sewer load to the nearest manholes including pumping main of suitable size electrical installations such as cables, switch boxes, MCC panels, isolators, float switches etc complete necessary for functioning of lifting stations all as directed by Engineer in charge. (For Elamkulam STP)	each	1.00000	392275.00	392275.00
TOTAL					392275.00
cost for one each					392275.00
	say				392275.00

	Add Water Charges @ 1.0%				3922.75
	Add CPOH @ 15.0%				59429.66
	Cost index 35.59 %				0.00
	Total with Cost index				455627.41
	Say				455627.41

9 Specification Code: od235048/2022_2023

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od235048/2022_2023 :Providing nonclog submercible pumpset of suitable capacity (2 HP) in lift manholes/ lifting stations for lifting and conveying the sewer load to the nearest manholes including pumping main of suitable size electrical installations such as cables, switch boxes, MCC panels, isolators, float switches etc complete necessary for functioning of lifting stations all as directed by Engineer in charge. (For Elamkulam STP)

Code	Description	Unit	Quantity	Rate	Amount
MR	Providing nonclog submercible pumpset of suitable capacity (2 HP) in lift manholes/ lifting stations for lifting and conveying the sewer load to the nearest manholes including pumping main of suitable size electrical installations such as cables, switch boxes,MCC panels, isolators ,float switches etc complete necessary for functioning of lifting stations all as directed by Engineer in charge. (For Elamkulam STP)	each	1.00000	348435.30	348435.30
TOTAL					348435.30
cost for one each					348435.30
	say				348435.30

	Add Water Charges @ 1.0%				3484.35
	Add CPOH @ 15.0%				52787.94
	Cost index 35.59 %				0.00
	Total with Cost index				404707.60
	Say				404707.60

10 Specification Code: od235058/2022_2023

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od235058/2022_2023 :Providing nonclog submercible pumpset of suitable capacity (3 HP) in lift manholes/ lifting stations for lifting and conveying the sewer load to the nearest manholes including pumping main of suitable size electrical installations such as cables, switch boxes,MCC panels, isolators ,float switches etc complete necessary for functioning of lifting stations all as directed by Engineer in charge. (For Elamkulam STP)

Code	Description	Unit	Quantity	Rate	Amount
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MR	Providing nonclog submercible pumpset of suitable capacity (3 HP) in lift manholes/ lifting stations for lifting and conveying the sewer load to the nearest manholes including pumping main of suitable size electrical installations such as cables, switch boxes, MCC panels, isolators ,float switches etc complete necessary for functioning of lifting stations all as directed by Engineer in charge. (For Elamkulam STP)	each	1.00000	331512.04	331512.04
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TOTAL					331512.04
cost for one each					331512.04
	say				331512.04

	Add Water Charges @ 1.0%				3315.12
	Add CPOH @ 15.0%				50224.07
	Cost index 35.59 %				0.00
	Total with Cost index				385051.23
	Other Engineering Organisations Say				385051.23

Design, Supply & delivery, construction and commissioning of all allied components for Wet-well1 (Block 12A), Wet-well 2 (Block 12B), Wet well 3 (Block 7) and Wet well 4 (Block 5) with allied components as per standard specifications

1 Specification Code: od238117/2022_2023

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od238117/2022_2023 :Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 1 with Screen and grit wells for Block 12A of Elamkulam Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, Construction of Control room with all facilities integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser, generator pedestal, Construction of compound wall 2.5meter height with barbed wire fencing 1.2m high , with a wicket gate along with main gate of adequate size etc complete as per specifications for highest quality standards - 1 no

Code	Description	Unit	Quantity	Rate	Amount
MR	Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 1 with Screen and grit wells for Block 12A of Elamkulam Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, Construction of Control room integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser ,pumproom, etc complete as per specifications for highest quality standards - 1 no	no	1.00000	6548000.0 0	6548000.0 0
MR	compatible capacity of generator set of reputed make with sturdy specifications with minimal vibration and noise including wiring, mounting roofing sheet, cange over switches	set	1.00000	2500000.0 0	2500000.0 0

Other Engineering Organisations

PRICE

MR	Construction of Compound Wall with Gate including Earthwork excavation filling sand for foundation and basement Cement concrete 1:3:6 using 12 to 20mm gauge hard broken stone jelly, Providing and laying in position machine batched, machine mixed and machine vibrated design mix cement concrete of M25 grade for reinforced cement concrete structural elements including steel reinforcement and cost for necessary form work, Stock brick work with II class bricks in cement mortar 1:6 for over 23 cm thick wall, plastering and whitewashing works, Supplying and fabricating and erection of iron gate with of required size (1 No Main gate 4mx2m and 1 No. wicket gate 1.2mx2m) as per direction at site with G.I pipes of 50 mm and specials at all sides and 40x40x6mm angles as bracing on which 2 No. of m.s sheet of 16 gauge of size 2x2m each is welded as two halves fixing letter "KMRL" including one coat of primer with red lead Supplying and fixing barbed wire fencing over proposed compound wall with 'L' angle iron 50 x 50 x 6mm & 1.45m posts bent to shape at 2.5m centres with 6 rows of barbed wire and also in a zig zag manner at 25cm c.c. connecting all the rows with barbed wire of 2 ply and 12 gauge or other approved size including drilling hole in 'L' iron posts and fixing the posts in cement concrete 1:2:4 of size 15x15x45cm etc necessary green belt, paer block road works of 5m width etc compelte all as per the directions	set	1.00000	1762000.00	1762000.00
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TOTAL					10810000.00
	cost for 1.1615 no				10810000.00
	cost for one no				9306930.69
	say				9306930.69

	Add Water Charges @ 1.0%				93069.30
	Add CPOH @ 15.0%				1409999.99
	Cost index 35.59 %				0.00

	Total with Cost index				10810000 .00
	Say				10810000 .00

2 Specification Code: od238168/2022_2023

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od238168/2022_2023 :Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 2 with Screen and grit wells for Block 12B of Elamkulam Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, Construction of pump room with facilities,Control room integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser ,Construction of compound wall 2.5meter height with barbed wire fencing 1.2m high , with a wicket gate along with main gate of adequate size etc complete as per specifications for highest quality standards - 1 no

Other Engineering Organisations

Code	Description	Unit	Quantity	Rate	Amount
MR	Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 2 with Screen and grit wells for Block 12B of Elamkulam Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, Construction of Control room integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser etc complete as per specifications for highest quality standards - 1 no	no	1.00000	11121000. 00	11121000. 00
MR	compatible capacity of generator set of reputed make with sturdy specifications with minimal vibration and noise including wiring,mounting roofing sheet,cange over switches all works including LT network Connection Charges	set	1.00000	3200000.0 0	3200000.0 0

MR	Construction of Compound Wall with Gate including Earthwork excavation filling sand for foundation and basement Cement concrete 1:3:6 using 12 to 20mm gauge hard broken stone jelly, Providing and laying in position machine batched, machine mixed and machine vibrated design mix cement concrete of M25 grade for reinforced cement concrete structural elements including steel reinforcement and cost for necessary form work, Stock brick work with II class bricks in cement mortar 1:6 for over 23 cm thick wall, plastering and whitewashing works, Supplying and fabricating and erection of iron gate with of required size (1 No Main gate 4mx2m and 1 No. wicket gate 1.2mx2m) as per direction at site with G.I pipes of 50 mm and specials at all sides and 40x40x6mm angles as bracing on which 2 No. of m.s sheet of 16 gauge of size 2x2m each is welded as two halves fixing letter "KMRL" including one coat of primer with red lead Supplying and fixing barbed wire fencing over proposed compound wall with 'L' angle iron 50 x 50 x 6mm & 1.45m posts bent to shape at 2.5m centres with 6 rows of barbed wire and also in a zig zag manner at 25cm c.c. connecting all the rows with barbed wire of 2 ply and 12 gauge or other approved size including drilling hole in 'L' iron posts and fixing the posts in cement concrete 1:2:4 of size 15x15x45cm etc necessary green belt, paer block road works of 5m width etc compelte all as per the directions	set	1.00000	1762000.00	1762000.00
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TOTAL					16083000.00
	cost for 1.1615 no				16083000.00
	cost for one no				13846749.89
	say				13846749.89

	Add Water Charges @ 1.0%				138467.49
	Add CPOH @ 15.0%				2097782.60
	Cost index 35.59 %				0.00

	Total with Cost index				16083000 .00
	Say				16083000 .00

3 Specification Code: od238281/2022_2023

od238281/2022_2023 :Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 3 with Screen and grit wells for Block 7 and KWA load of Elamkulam Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWFwith optimal pump-set operating plan with stand-bye pumps,compatible capacity silent generator set meeting CPCB norms of reputed make including wiring,mounting,roofing sheets, change over switches, Construction of pump room with facilities, Control room integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser,Construction of compound wall 2.5meter height with barbed wire fencing 1.2m high , with a wicket gate along with main gate of adequate size etc complete asper specifications for highest quality standards - 1 no

Code	Description	Unit	Quantity	Rate	Amount
MR	Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 3 with Screen and grit wells for Block 7 and KWA load of Elamkulam Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWFwith optimal pump-set operating plan with stand-bye pumps,compatible capacity silent generator set meeting CPCB norms of reputed make including wiring,mounting,roofing sheets, change over switches, Construction of Control room integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser etc complete asper specifications for highest quality standards - 1 no	set	1.00000	8810000.0 0	8810000.0 0

MR	compatible capacity silent generator set meeting CPCB norms of reputed make including wiring, mounting, roofing sheets, change over switches all works including LT network connection	set	1.00000	2500000.00	2500000.00
MR	Construction of Compound Wall with Gate including Earthwork excavation filling sand for foundation and basement Cement concrete 1:3:6 using 12 to 20mm gauge hard broken stone jelly, Providing and laying in position machine batched, machine mixed and machine vibrated design mix cement concrete of M25 grade for reinforced cement concrete structural elements including steel reinforcement and cost for necessary form work, Stock brick work with II class bricks in cement mortar 1:6 for over 23 cm thick wall, plastering and whitewashing works, Supplying and fabricating and erection of iron gate with of required size (1 No Main gate 4mx2m and 1 No. wicket gate 1.2mx2m) as per direction at site with G.I pipes of 50 mm and specials at all sides and 40x40x6mm angles as bracing on which 2 No. of m.s sheet of 16 gauge of size 2x2m each is welded as two halves fixing letter "KMRL" including one coat of primer with red lead Supplying and fixing barbed wire fencing over proposed compound wall with 'L' angle iron 50 x 50 x 6mm & 1.45m posts bent to shape at 2.5m centres with 6 rows of barbed wire and also in a zig zag manner at 25cm c.c. connecting all the rows with barbed wire of 2 ply and 12 gauge or other approved size including drilling hole in 'L' iron posts and fixing the posts in cement concrete 1:2:4 of size 15x15x45cm etc necessary green belt, paer block road works of 5m width etc compelte all as per the directions	set	1.00000	1762000.00	1762000.00

TOTAL					13072000.00
	cost for 1.1615 set				13072000.00
	cost for one set				11254412.40
	say				11254412.40

	Add Water Charges @ 1.0%				112544.12
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	Add CPOH @ 15.0%				1705043.47
	Cost index 35.59 %				-0.01
	Total with Cost index				13072000.00
	Say				13072000.00

4 Specification Code: od238243/2022_2023

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od238243/2022_2023 :Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 4 with Screen and grit wells for Block 5 of Elamkulam Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, Construction of pump room with facilities, Control room integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser, Construction of compound wall 2.5meter height with barbed wire fencing 1.2m high , with a wicket gate along with main gate of adequate size etc complete as per specifications for highest quality standards - 1 no

Code	Description	Unit	Quantity	Rate	Amount
MR	Design, Supply & Delivery, Construction and commissioning of all allied components for Wet well 4 with Screen and grit wells for Block 5 of Elamkulam Zone for the ultimate sewage load during 2055 with M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pumpset arrangements with pipe connections compatible to 1DWF, 2 DWF and 3 DWF with optimal pump-set operating plan with stand-bye pumps, Construction of Control room integrally with that required for adjoining STP Components with control panels compatible to PLC controls including control valves, chambers all allied pipe connections, Silt pit, silt raiser etc complete as per specifications for highest quality standards - 1 no	no	1.00000	10490000.00	10490000.00

MR	compatible capacity of generator set of reputed make with sturdy specifications with minimal vibration and noise including wiring,mounting roofing sheet,cange over switches	set	1.00000	2500000.0 0	2500000.0 0
MR	Construction of Compound Wall with Gate including Earthwork excavation filling sand for foundation and basement Cement concrete 1:3:6 using 12 to 20mm gauge hard broken stone jelly,Providing and laying in position machine batched, machine mixed and machine vibrated design mix cement concrete of M25 grade for reinforced cement concrete structural elements including steel reinforcement and cost for necessary form work,Stock brick work with II class bricks in cement mortar 1:6 for over 23 cm thick wall , plastering and whitewashing works,Supplying and fabricating and erection of iron gate with of required size (1 No Main gate4mx2m and 1 No. wicket gate1.2mx2m)as per direction at site with G.I pipes of 50 mm and specials at all sides and 40x40x6mm angles as bracing on which 2 No.of m.s sheet of 16 gauge of size 2x2m each is welded as two halves fixing letter "KMRL' including one coat of primer with red lead Supplying and fixing barbed wire fencing over proposed compound wall with 'L' angle iron 50 x 50 x 6mm & 1.45m posts bent to shape at 2.5m centres with 6 rows of barbed wire and also in a zig zag manner at 25cm c.c. connecting all the rows with barbed wire of 2 ply and 12 gauge or other approved size including drilling hole in 'L' iron posts and fixing the posts in cement concrete 1:2:4 of size 15x15x45cm etc necesary green belt, paer block road works of 5m width etc compelte all as per the directions	set	1.00000	1762000.0 0	1762000.0 0

TOTAL					14752000.00
	cost for 1.1615 no				14752000.00
	cost for one no				12700817.91
	say				12700817.91

	Add Water Charges @ 1.0%				127008.1 7
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	Add CPOH @ 15.0%				1924173.91
	Cost index 35.59 %				-0.01
	Total with Cost index				14752000.00
	Say				14752000.00

Supply & Delivery, laying of pumping main including Air and Scour valves to Pumping mains 4 nos for Elamkulam Collection system

1 Specification Code: 2.10.1.3

SUBHEAD : 2.0

EARTH WORK

2.10

Excavating trenches of required width for pipes, cables, etc including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m, including getting out the excavated soil. and then returning the soil as required, in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m:

2.10.1.3 Pipes, cables etc. exceeding 300 mm dia but not exceeding 600 mm

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 60 m length of a pipe of an average dia. say 450mm. Slope assumed 1 in 200. Earth work and filling- Minimum depth of trench = $0.75+0.45=1.20\text{m}$ Average depth = $(1.50+1.20)/2 = 1.35\text{ m}$ Width = $0.40 + 0.45 = 0.85\text{ m}$ $60 \times 0.85 \times 1.35 = 68.85\text{ cum}$ 5% for collars = 3.44 cum Total = 72.29 cum				

2.8.1	Rate as per item Number 2.8.1 of SH: Earth Work	cum	72.29	219.00	15831.51(A)
2.25	Rate as per item Number 2.25 of SH: Earth Work	cum	72.29	190.70	13785.70(A)

TOTAL					29616.00
Cost of 60.0 metre					29616.00
Cost of 1 metre					493.60
Say					493.6

	Cost index	35.59 %			175.67
	Total with Cost index				669.27

2 Specification Code: 100.7.1

100.7.1

Bailing out water with 5 HP engine and pump set including conveyance to the site, erection, dismantling and taking back of engine and pump, cost of fuel lubricating oil and other stores pay of staff etc. complete.

NEW DATA (Prepared based on PHED SDB - Item No.1070)

Code	Description	Unit	Quantity	Rate	Amount
0011	Hire charges of Pump set of capacity 4000 litres/hour Hire charges of Engine (Per Day) charges for cost of service of operating staff, cost of lubricating oil, diesel / petrol / kerosene oil, other consumables for running the plant and machinery and all the taxes.	Day	1.0	700.00	700.00
TOTAL					700.00
Add Water Charges @ 1%					7.00

TOTAL	707.00
Add CPOH @ 15%	106.05
TOTAL	813.05
Cost of 29.84 Kwh	813.05
Cost per Kwh	27.25
Say	27.25

Cost index 35.59 %	9.70
Total with Cost index	36.95

3 Specification Code: 60.2.7

60.2.7 BAILING OUT WATER BY ENGAGING COOLIE - Bailing out water by engaging coolie where ever necessary where pumping with engine and pump set not possible

Code	Description	Unit	Quantity	Rate	Amount
	1 Day				
0115	Coolie	Day	1.0	558.00	558.00
TOTAL					558.00
Add Water Charges @ 1%					5.58
TOTAL					563.58
Add CPOH @ 15%					84.54
TOTAL					648.12
Cost of 1.0 Day					648.12
Cost per Day					648.12
Say					648.1

Cost index 35.59 %	230.66
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	Total with Cost index				878.76
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4 Specification Code: od243527/2022_2023

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od243527/2022_2023 :Providing steel sheet shoring to the sides of the trenches upto a an average depth of 2.5 m using 6mm M.S. sheet 0.5m wide, stiffened on edges with 50mm x 50mm x 6mm MS angles driving down vertically on either side one after another in line and level with suitable pile driving equipments and accessories to a maximum depth of 0.50 M below the bottom of the proposed excavation 0.5 M above ground level suitably braced by horizontal walling pieces at 75 x 150 mm x 8 mm angles on either side at intervals not exceeding 1.50M and horizontal screw jack type struts at 1.50M intervals and maintaining the shoring till the pipes are laid and works are completed, dismantling, cleaning and restacking for reuse including all labour, hire charges and conveyance for equipments, tools and plants and sundries etc. complete.

Code	Description	Unit	Quantity	Rate	Amount
MR	Providing steel sheet shoring to the sides of the trenches upto a depths of 2.5 m using 6mm M.S. sheet 0.5m wide, stiffened on edges with 50mm x 50mm x 6mm MS angles driving down vertically on either side one after another in line and level with suitable pile driving equipments and accessories to a maximum depth of 0.50 M below the bottom of the proposed excavation 0.5 M above ground level suitably braced by horizontal walling pieces at 75 x 150 mm x 8 mm angles on either side at intervals not exceeding 1.50M and horizontal screw jack type struts at 1.50M intervals and maintaining the shoring till the pipes are laid and works are completed, dismantling, cleaning and restacking for reuse including all labour, hire charges and conveyance for equipments, tools and plants and sundries etc. complete.	per sqm	1.00000	350.62	350.62
TOTAL					350.62
cost for one per sqm					350.62
	say				350.62

	Add Water Charges @ 1.0%				3.50
	Add CPOH @ 15.0%				53.11

	Cost index 35.59 %				-0.01
	Total with Cost index				407.25
	Say				407.25

5 Specification Code: 2.16.1

2.16 Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete (Measurements to be taken of the face area timbered).

2.16.1 Depth not exceeding 1.5m

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a trench 30m long and 1.5 m deep. Area = $2 \times 30 \times 1.5 = 90$ sqm. MATERIAL: The material can based four times on the same work and after use of material credit is give @ 75% of cost poling boards of				
1198	Second class kail wood in planks Second class kail wood in planks $90 \times 0.038 = 3.42$ cum = 3420 cudm Qty taken for cost of using once after deducting for credit = $3420 \times 1/4 \times 1/4 = 213.75$ cudm Wallings 100mmx 100 mm of	10 cud m	213.75	260.00	5557.5
1197	Second class kail wood in scantling $4 \times 30 \times 0.10 \times 1.10 = 1.20$ cum = 1200 cudm Qty taken for cost of using once after deducting for credit = $1200 \times 1/4 \times 1/4 = 75$ cudm	10 cud m	75.0	260.00	1950.0

0302	Safeda ballies 125 mm diameter long 2x17x1.50 = 51 m Qty taken for cost of using once after deducting for credit =51x1/4x1/4=3.1875m CARRIAGE: Poling boards = 3.42 cum Walling = 1.20 cum. Balli struts : 3.14/4x(0.125)3x51= 0.63cum Total of carriage = 5.25x1/4 = 1.3125 cum	metre	3.1875	40.00	127.50
2204	Carriage of Timber	cum	1.3125	118.59	155.65
0112	Carpenter 2nd class	Day	0.5	679.00	339.50
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL	8741.97
Add Water Charges @ 1%	87.42
TOTAL	8829.39
Add CPOH @ 15%	1324.41
TOTAL	10153.80
Cost of 90.0 sqm	10153.80
Cost per sqm	112.82
Say	112.8

Cost index	35.59 %				40.15
Total with Cost index					152.95

6 Specification Code: 100.14.5

SUBHEAD : 100.0

KWA APPROVED DATA

100.14.5

Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials :

300 mm dia Ductile Iron Class K-9 Pipes

Data derived from 18.72.19 in DAR

Code	Description	Unit	Quantity	Rate	Amount
	Details for 10metre Materials 300mm dia. pipes (in 5.5m lengths). Weight of 1m pipe = 60.49kg; Weight of 10m pipes - 60.49x10 = 604.90kg.				
2324	Carriage of Spun iron S & S pipes 300 mm dia	100 meter	10.0	1080.08	108.01
18.23	Rate as per item Number 18.23 of SH: Water Supply Labour for laying	quintal	6.049	229.40	1387.64(A)
Add Water Charges @ 1% except on A ie on (1495.65-1387.64=108.00999)					1.08
TOTAL					1496.73
Add CPOH @ 15% except on A ie on (1496.73-1387.64=109.08999)					16.36
TOTAL					1513.00
Cost of 10.0 metre					1513.00
Cost of 1 metre					151.30
Say					151.3

	Cost index 35.59 %				53.85
	Total with Cost index				205.15

7 Specification Code: 100.14.6

SUBHEAD : 100.0

KWA APPROVED DATA

100.14.6

Conveying and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS: 8329 excluding cost of pipes and specials :
350 mm dia Ductile Iron Class K-9 Pipes
Data derived from 18.72.20 in DAR

Code	Description	Unit	Quantity	Rate	Amount
	Details for 10metre Materials 350mm dia. pipes (in 5.5m lengths). Weight of 1m pipe = 79.73kg; Weight of 10m pipes - 79.73x10 = 797.30kg.				
2325	Carriage of Spun iron S & S pipes 350 mm dia	100 meter	10.0	1512.11	151.21
18.23	Rate as per item Number 18.23 of SH: Water Supply Labour for laying	quintal	7.973	229.40	1829.01(A)
Add Water Charges @ 1% except on A ie on (1980.22-1829.01=151.20999)					1.51
TOTAL					1981.73
Add CPOH @ 15% except on A ie on (1981.73-1829.01=152.71999)					22.91
TOTAL					2004.50
Cost of 10.0 metre					2004.50
Cost of 1 metre					200.45
Say					200.45

	Cost index 35.59 %				71.34
	Total with Cost index				271.79

8 Specification Code: 18.30.7

18.30 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:

18.30.7 300 mm diameter pipe

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 joints MATERIAL:				
1379	Rubber insertions for 300 mm dia pipe joints	each	10.0	45.00	450.00
1960	Bolts and nuts 20 mm dia 75 mm long	each	120.0	16.00	1920.00
9977	Carriage of materialsLABOUR:	L.S	5.33	2.00	10.66
0116	Fitter(grade1)	Day	0.4	738.00	295.20
0117	Assistant Fitter or 2nd class fitter	Day	0.4	679.00	271.60
0114	Beldar	Day	1.3	558.00	725.40
TOTAL					3672.86
Add Water Charges @ 1%					36.73
TOTAL					3709.59
Add CPOH @ 15%					556.44
TOTAL					4266.03
Cost of 10.0 no					4266.03
Cost of each					426.60
Say					426.6

	Cost index 35.59 %				151.83
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	Total with Cost index				578.43
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9 Specification Code: 18.30.8

18.30 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:

18.30.8 350 mm diameter pipe

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 joints MATERIAL:				
1380	Rubber insertions for 350 mm dia pipe joints	each	10.0	50.00	500.00
1961	Bolts and nuts 20 mm dia 80 mm long	each	160.0	18.00	2880.00
9977	Carriage of materialsLABOUR:	L.S	5.33	2.00	10.66
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0117	Assistant Fitter or 2nd class fitter	Day	0.5	679.00	339.50
0114	Beldar	Day	1.5	558.00	837.00
TOTAL					4936.16
Add Water Charges @ 1%					49.36
TOTAL					4985.52
Add CPOH @ 15%					747.83
TOTAL					5733.35
Cost of 10.0 no					5733.35
Cost of each					573.34
Say					573.35

	Cost index 35.59 %				204.06
	Total with Cost index				777.41

10 Specification Code: 18.70.5**18.70**

Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron Pipes including testing of joints and including the cost of rubber gasket:

18.70.5

300 mm dia pipe

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 50 joints MATERIAL:				
7671	Rubber Gaskets conforming to I.S. 5382 of S.B.R quality 300 mm dia LABOUR:	each	50.0	110.00	5500.00
0116	Fitter(grade1)	Day	3.0	738.00	2214.00
0117	Assistant Fitter or 2nd class fitter	Day	3.0	679.00	2037.00
0114	Beldar	Day	6.0	558.00	3348.00
TOTAL					13099.00
Add Water Charges @ 1%					130.99
TOTAL					13229.99
Add CPOH @ 15%					1984.50
TOTAL					15214.49
Cost of 50.0 joint					15214.49
Cost per joint					304.29
Say					304.3

	Cost index 35.59 %				108.30
	Total with Cost index				412.60

11 Specification Code: 18.70.6**18.70**

Providing push - on-joints to Centrifugally (Spun) Cast Iron Pipes or Ductile Iron

Pipes including testing of joints and including the cost of rubber gasket:

18.70.6 350 mm dia pipes

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 50 joints MATERIAL:				
7672	Rubber Gaskets conforming to I.S. 5382 of S.B.R quality 350 mm dia LABOUR:	each	50.0	126.00	6300.00
0116	Fitter(grade1)	Day	3.0	738.00	2214.00
0117	Assistant Fitter or 2nd class fitter	Day	3.0	679.00	2037.00
0114	Beldar	Day	6.0	558.00	3348.00
TOTAL					13899.00
Add Water Charges @ 1%					138.99
TOTAL					14037.99
Add CPOH @ 15%					2105.70
TOTAL					16143.69
Cost of 50.0 joint					16143.69
Cost per joint					322.87
Say					322.85

	Cost index 35.59 %				114.90
	Total with Cost index				437.75

12 Specification Code: 18.83.7

18.83 Labour for cutting C.I. pipe with steel saw.

18.83.7 300 mm diameter C.I. pipe

Code	Description	Unit	Quantity	Rate	Amount
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	Details of cost for one cut LABOUR:				
0116	Fitter(grade1)	Day	0.3	738.00	221.40
0114	Beldar	Day	0.3	558.00	167.40
9999	Sundries-	L.S	9.88	2.00	19.76

TOTAL					408.56
Add Water Charges @ 1%					4.09
TOTAL					412.65
Add CPOH @ 15%					61.90
TOTAL					474.55
Cost of 1.0 Each Cut					474.55
Cost per Each Cut					474.55
Say					474.55

	Cost index 35.59 %			168.89
	Total with Cost index			643.44

13 Specification Code: 18.83.8

18.83 Labour for cutting C.I. pipe with steel saw.

18.83.8 350 mm diameter C.I pipe

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one cut LABOUR:				
0116	Fitter(grade1)	Day	0.35	738.00	258.30
0114	Beldar	Day	0.35	558.00	195.30
9999	Sundries-	L.S	10.79	2.00	21.58
TOTAL					475.18

Add Water Charges @ 1%	4.75
TOTAL	479.93
Add CPOH @ 15%	71.99
TOTAL	551.92
Cost of 1.0 Each Cut	551.92
Cost per Each Cut	551.92
Say	551.9

Cost index 35.59 %	196.42
Total with Cost index	748.32

14 Specification Code: 100.35.5

SUBHEAD : 100.0

KWA APPROVED DATA

Testing 300mm DI/CI pipeline with potable water to the required test pressure.

100.35.5

300 mm dia

Observed Data derived from item no.1023 of PHED DATA

Code	Description	Unit	Quantity	Rate	Amount
	Details of Cost For 150 m				
KW8	Cost of Potable Water	Kilo litre	10.6	60.00	636.00
100.99.5 9	Rate as per item Number 100.99.59 of SH: KWA Approved Data Cost of water required for filling the pipeline including conveyance charges for the water to the site of testing (without w/c&CPOH)	Kilo litre	10.6	73.20	775.92

100.99.65	Rate as per item Number100.99.65 of SH: KWA Approved Data Hire charges for 75mm long 20mm bolts &nuts (1/8 of the cost)	each	24.0	2.00	48.00
0116	Fitter(grade1) for fixing Dummy plates etc & connecting the pipeline to the pump delivery	Day	2.0	738.00	1476.00
0114	Beldar for assisting	Day	2.0	558.00	1116.00
100.99.43	Rate as per item Number100.99.43 of SH: KWA Approved Data Hire charges for rubber packing (1/4 of the actual cost) (rubber insertions for 300mm dia pipe joints - 2 nos @Rs 45/E)	each	2.0	11.25	22.50
18.70.5	Rate as per item Number18.70.5 of SH: Water Supply **Cost of providing 2nos joints (lead, cement or rubber ring joints as the case may be) for fitting the tailpiece vide corresponding item of the schedule	joint	2.0	304.30	608.60(A)
0011	Hire charges of Pump set of capacity 4000 litres/hour	Day	0.5	700.00	350.00
9999	Sundries - Hire charges for reciprocating pumps for building up pressure to the required test pressure	L.S	100.0	2.00	200.00
9999	Sundries - Hire charges for pressure gauge etc.	L.S	25.0	2.00	50.00

100.99.67	Rate as per item Number 100.99.67 of SH: KWA Approved Data **Dismantling the lead, rubber ring or cement joint etc. & stacking materials for future use (Adopt 50% of the cost of jointing)	each	2.0	152.15	304.30(A)
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Add Water Charges @ 1% except on A ie on (5587.32-912.89996=4674.42)					46.74
TOTAL					5634.06
Add CPOH @ 15% except on A ie on (5634.06-912.89996=4721.16)					708.17
TOTAL					6345.00
Cost of 150.0 metre					6345.00
Cost of 1 metre					42.30
Say					42.3

Other Engineering Organisations

Cost index 35.59 %					13.29
Total with Cost index					55.59

15 Specification Code: 100.35.6

SUBHEAD : 100.0

KWA APPROVED DATA

Testing 350mm DI/CI pipeline with potable water to the required test pressure.
100.35.6 350 mm dia
 Observed Data derived from item no.1024 of PHED DATA

Code	Description	Unit	Quantity	Rate	Amount
	Details of Cost For 150 m				

KW8	Cost of Potable Water	Kilo litre	14.4	60.00	864.00
100.99.59	Rate as per item Number100.99.59 of SH: KWA Approved Data Cost of water required for filling the pipeline including conveyance charges for the water to the site of testing (without w/c&CPOH)	Kilo litre	14.4	73.20	1054.08
100.99.68	Rate as per item Number100.99.68 of SH: KWA Approved Data Hire charges for 80mm long 20mm bolts &nuts (1/8 of the cost)	each	32.0	2.25	72.00
0116	Fitter(grade1) for fixing Dummy plates etc & connecting the pipeline to the pump delivery	Day	2.5	738.00	1845.00
0114	Beldar for assisting	Day	2.5	558.00	1395.00
100.99.44	Rate as per item Number100.99.44 of SH: KWA Approved Data Hire charges for rubber packing (1/4 of the actual cost) (rubber insertions for 350mm dia pipe joints - 2 nos @Rs 50/E)	each	2.0	12.50	25.00
18.70.6	Rate as per item Number18.70.6 of SH: Water Supply **Cost of providing 2nos joints (lead, cement or rubber ring joints as the case may be) for fitting the tailpiece vide corresponding item of the schedule	joint	2.0	322.85	645.70(A)
0011	Hire charges of Pump set of capacity 4000 litres/hour	Day	0.5	700.00	350.00

9999	Sundries - Hire charges for reciprocating pumps for building up pressure to the required test pressure	L.S	100.0	2.00	200.00
9999	Sundries - Hire charges for pressure gauge etc.	L.S	25.0	2.00	50.00
100.99.70	Rate as per item Number 100.99.70 of SH: KWA Approved Data	each	2.0	161.45	322.90(A)

Add Water Charges @ 1% except on A ie on (6823.68-968.6=5855.08)					58.55
TOTAL					6882.23
Add CPOH @ 15% except on A ie on (6882.23-968.6=5913.63)					887.04
TOTAL					7770.00
Cost of 150.0 metre					7770.00
Other Engineering Organisation Cost of 1 metre					51.80
Say					51.8

Cost index 35.59 %					16.05
Total with Cost index					67.85

16 Specification Code: 100.98.119

SUBHEAD 100.0

KWA APPROVED DATA

100.98.119

Supply of DI K9 Pipe Conforming to IS 8329/2000, 300mm Dia.

Code	Description	Unit	Quantity	Rate	Amount

7655	Ductile Iron class K - 9 pipe Conforming to I.S. 8329 - 300 mm dia	metre	1.0	2750.00	2750.00
TOTAL					2750.00
Add Water Charges @ 1%					27.50
TOTAL					2777.50
Add CPOH @ 15%					416.62
Costof 1.0 metre					3194.12
Cost of 1 metre					3194.12
Say					3194.1

	Cost index	35.59 %			.00
	Total with Cost index				3537.65

17 Specification Code: 100.98.120

Other Engineering Organisations

PRICE
SUBHEAD 100.0
KWA APPROVED DATA

100.98.120

Supply of DI K9 Pipe Conforming to IS 8329/2000, 350mm Dia.

Code	Description	Unit	Quantity	Rate	Amount
7656	Ductile Iron class K - 9 pipe Conforming to I.S. 8329 - 350 mm dia	metre	1.0	3350.00	3350.00
TOTAL					3350.00
Add Water Charges @ 1%					33.50
TOTAL					3383.50
Add CPOH @ 15%					507.52
Costof 1.0 metre					3891.02

Cost of 1 metre	3891.02
Say	3891.0

Cost index	35.59 %				.00
Total with Cost index					4333.00

18 Specification Code: 18.69.1

SUBHEAD : 18.0

WATER SUPPLY

18.69 Providing and laying D.I Specials of Class K - 12 suitable for mechanical jointing as per IS : 9523 :

18.69.1 Upto 600 mm dia

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL:				
7684	Ductile Iron specials suitable for mechanical jointing as per I.S. 9523 utp 600 mm dia	quintal	1.0	13050.00	13050.00
2309	Carriage of Cast iron fittings Labour for laying	tonne	0.1	92.24	9.22
18.24	Rate as per item Number 18.24 of SH: Water Supply	quintal	1.0	426.70	426.70(A)
Add Water Charges @ 1% except on A ie on (13485.92-426.7=13059.22)					130.59
TOTAL					13616.51
Add CPOH @ 15% except on A ie on (13616.51-426.7=13189.81)					1978.47
TOTAL					15595.00

Cost of 1.0 quintal	15595.00
Say	15595.0

Cost index	35.59 %				5550.26
Total with Cost index					21145.26

19 Specification Code: od238709/2022_2023

**od238709/2022_2023 :Providing, laying and fixing C.I. sluice valves (with cap) and connecting lead dwc pipe of 200mm dia to the nearest manhole considering an average distance. all completme with bolts, nuts, rubber installation etc. cost include all necessary specials, labour ,material,etc all complete.
200mm dia for 10 sluice valve**

Code	Description	Unit	Quantity	Rate	Amount
3320	C.I. sluice valve (with caps) class II : 200 mm dia	each	10.00000	8900.00	89000.00
2309	Cast iron fittings	tonne	2.30000	92.24	212.15
18.24	Rate as per item number 18.24 of SH: Water Supply	quintal	22.99000	367.37	8445.84
18.31.4.2	Rate as per item number 18.31.4.2 of SH: Water Supply	no	20.00000	9998.19	199963.80
MR	providing and supplying of DWC 200mm dia pipe (rate from SOR 22 23 GWSSB)	metre	200.00000	738.00	147600.00
MR	laying of DWC 200mm dia pipe (rate from SOR 22 23 GWSSB)	metre	200.00000	33.00	6600.00
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					452421.79
	cost for 10.0 no				452421.79
	cost for one no				45242.18
	say				45242.18

	Add Water Charges @ 1.0%				452.42
	Add CPOH @ 15.0%				6854.19
	Cost index 35.59 %				12327.82
	Total with Cost index				64876.62
	Say				64876.62

20 Specification Code: od225067/2022_2023

**od225067/2022_2023 :Supplying and fixing C.I double acting air valve of approved quality with bolts, nuts, rubber placing including cost of air valves, specials, labour, hire charges etc. complete
80 mm dia**

Details of cost for one no.

MATERIAL:

Code	Description	Unit	Quantity	Rate	Amount
7416	Double acting air valve 80 mm	each	10.00000	4525.00	45250.00
9977	Carriage of air valves	L.S	26.00000	2.00	52.00
9999	Sundries Labour for laying double acting air valve Providing flanged joints to double acting air valves with bolts, nuts and rubber insertion etc.	L.S	52.00000	2.00	104.00
18.30.1	Rate as per item number 18.30.1 of SH: Water Supply	no	10.00000	126.43	1264.31
MR	Sundries for specials (2%)	L.S	1.00000	118.20	118.20
TOTAL					46788.51
	cost for 10.0 no				46788.51
	cost for one no				4678.85
	say				4678.85

	Add Water Charges @ 1.0%				46.78
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	Add CPOH @ 15.0%				708.84
	Cost index 35.59 %				1929.24
	Total with Cost index				7363.73
	Say				7363.73

21 Specification Code: 5.2.2

5.2: Reinforced cement concrete work in walls (any thickness), including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, piers, abutments, posts and struts etc. up to floor five level excluding cost of centering, shuttering, finishing and reinforcement :

5.2.2 1:1.5:3(1 cement : 1.5 coarse sand : 3 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 9.18 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	5.2326	1350.00	7064.01
0297	Stone Aggregate(single size): 10 mm nominal size	cum	2.5704	1350.00	3470.04
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	7.803	103.77	809.72
0982	Coarse sand (zone III)	cum	3.9015	1350.00	5267.03
2203	Carriage of Coarse sand	cum	3.9015	103.77	404.86
0367	Portland Cement (0.2833 cum)	tonne	3.672	4940.00	18139.68
2209	Carriage of Cement LABOUR:	tonne	3.672	92.24	338.71
0114	Beldar	Day	11.29	558.00	6299.82
0115	Coolie	Day	7.53	558.00	4201.74

0101	Bhisti	Day	8.26	617.00	5096.42
0123	Mason (brick layer) 1st class	Day	0.92	738.00	678.96
0124	Mason (brick layer)2nd class	Day	0.92	679.00	624.68
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.64	800.00	512.00
0012	Vibrator (Needle type 40 mm)	Day	0.64	370.00	236.80
9999	Sundries-	L.S	131.82	2.00	263.64
9999	Sundries-Extra labour for lifting of material up to floor V level: 0.75x9. 18x2.5	L.S	420.03	2.00	840.06
0115	Coolie	Day	17.21	558.00	9603.18

TOTAL					63851.35
Add Water Charges @ 1%					638.51
TOTAL					64489.86
Add CPOH @ 15%					9673.48
TOTAL					74163.34
Cost of 9.18 cum					74163.34
Cost per cum					8078.79
Say					8078.8

Cost index 35.59 %					2875.24
Total with Cost index					10954.04

22 Specification Code: od225071/2022_2023

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od225071/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

23 Specification Code: 5.22.6

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6

Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69

9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL					6241.51
Add Water Charges @ 1%					62.42
TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52
Cost per kilogram					72.50
Say					72.5

Cost index 35.59 %					25.80
Total with Cost index					98.30

24 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50

9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

Other Engineering Organisations				TOTAL	1418.21
Add Water Charges @ 1%					14.18
				TOTAL	1432.39
Add CPOH @ 15%					214.86
				TOTAL	1647.25
Cost of 10.0 sqm					1647.25
Cost per sqm					164.72
Say					164.7

	Cost index 35.59 %				58.62
	Total with Cost index				223.32

25 Specification Code: 50.2.25.1

50.2.25.1

Filling with contractor's own earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m as per direction of site Engineer-in-charge

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one each				
0979	Royalty for good earth	cum	1.0	40.00	40.00
2241	Carriage of Good earth	cum	1.0	129.71	129.71
0128	Mate	Day	0.02	617.00	12.34
0115	Coolie	Day	0.25	558.00	139.50
0101	Bhisti	Day	0.02	617.00	12.34
TOTAL					333.89
Add Water Charges @ 1%					3.34
TOTAL					337.23
Add CPOH @ 15%					50.58
TOTAL					387.81
Cost of 1.0 cum					387.81
Cost per cum					387.81
Say					387.8

	Cost index 35.59 %				138.02
	Total with Cost index				525.82

26 Specification Code: 51.2.3

51.2.3

Filling with Quarry Muck

Filling up low lying and water logged areas with local material/ quarry muck, spreading in layers, leveling the top at site and consolidation by ramming, etc complete for improving the CBR value of subgrade

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 300 cum				
	Materials				
MR1209	Cost of quarry muck Labour	cum	300.0	750.00	225000.00
0128	Mate	Day	0.4	617.00	246.80
0139	Skilled Beldar (for floor rubbing etc.)	Day	2.0	617.00	1234.00
0114	Beldar	Day	8.0	558.00	4464.00
TOTAL					230944.80
Add Water Charges @ 1%					2309.45
TOTAL					233254.25
Add CPOH @ 15%					34988.14
TOTAL					268242.39
Cost of 300.0 cum					268242.39
Cost per cum					894.14
Say					894.15

	Cost index 35.59 %				8.19
	Total with Cost index				902.34

27 Specification Code: od238307/2022_2023

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od238307/2022_2023 :Construction valve chamber of suitable size for air valves and Scour valves in the

pumping mains including earthwork excavation by manually/mechanically, backfilling the trenches ,sandfilling for a thickness of 15cm over which levelling course 1:3:6 with 40mm aggregates RCC walls M30 grade for bottom slab and side walls, precast RCC M15 cover slab including form work and steel reinforcement, Plastering inside with cement mortar 1:3 (SRC) for 20mm thick,Plastering outside with cement mortar 1:3 (SRC) for 12mm thick,Refilling with excavated soil ,Disposal of surplus earth work,Supplying and fixing CI stepsetc complete all cost for labour materials, hire charges for tools and plants .conveyance charges etc complete 11 Nos for Elamkulam Pumping mains

Code	Description	Unit	Quantity	Rate	Amount
MR	Construction valve chamber of suitable size for air valves and Scour valves in the pumping mains including earthwork excavation by manually/mechanically, backfilling the trenches ,sandfilling for a thickness of 15cm over which levelling course 1:3:6 with 40mm aggregates RCC walls M30 grade for bottom slab and side walls, precast RCC M15 cover slab including form work and steel reinforcement, Plastering inside with cement mortar 1:3 (SRC) for 20mm thick,Plastering outside with cement mortar 1:3 (SRC) for 12mm thick,Refilling with excavated soil ,Disposal of surplus earth work,Supplying and fixing CI stepsetc complete all cost for labour materials, hire charges for tools and plants .conveyance charges etc complete 11 Nos for Elamkulam Pumping mains	job	1.00000	1180000.00	1180000.00
TOTAL					1180000.00
	cost for 1.16 set				1180000.00
	cost for one set				1017241.38
	say				1017241.38

	Add Water Charges @ 1.0%				10172.41
	Add CPOH @ 15.0%				154112.06
	Cost index 35.59 %				0.00
	Total with Cost index				1181525.86

	Say				1181525. 86
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Laying of pipes under NH 66 and PWD Road by HDD method to Elamkulam STP

1 Specification Code: od225056/2022_2023

od225056/2022_2023 :Drilling of 600mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 500mm dia M.S casing pipe of minimum 8mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority

Code	Description	Unit	Quantity	Rate	Amount
MR	Rate taken from SOR 22 23 GWSSB (Gujarat)	metre	1.00000	9166.00	9166.00
TOTAL					9166.00
cost for one metre					9166.00
	say				9166.00

	Add Water Charges @ 1.0%				91.66
	Add CPOH @ 15.0%				1388.64
	Cost index 35.59 %				0.00
	Total with Cost index				10646.31
	Say				10646.31

2 Specification Code: od236528/2022_2023

od236528/2022_2023 :Drilling of 1300mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 1200mm dia M.S casing pipe of minimum 8mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate

including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority.

Code	Description	Unit	Quantity	Rate	Amount
MR	Rate taken from SOR 22 23 GWSSB (Gujarat)	metre	1.00000	36583.00	36583.00
TOTAL					36583.00
cost for one metre					36583.00
	say				36583.00

	Add Water Charges @ 1.0%				365.83
	Add CPOH @ 15.0%				5542.32
	Cost index 35.59 %				0.00
	Total with Cost index				42491.15
	Say				42491.15

Laying of pipes under railway lines by HDD method to Elamkulam STP

1 Specification Code: od225056/2022_2023

od225056/2022_2023 :Drilling of 600mm dia horizontal borehole for pipeline under the Railway tracks/roads inc all strata with required length including fixing of 500mm dia M.S casing pipe of minimum 8mm thick as per instruction & regulations of railway authority & under supervision of railway authority including rate including the cost of drilling, welding ,pushing etc complete .But excluding the cost of pipe, valves and other items. etc. Complete with all material, labour, fabrication. Entire work should be as per approved Drawing and as per instructions of railway/Road authority

Code	Description	Unit	Quantity	Rate	Amount
MR	Rate taken from SOR 22 23 GWSSB (Gujarat)	metre	1.00000	9166.00	9166.00
TOTAL					9166.00
cost for one metre					9166.00

	say				9166.00
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	Add Water Charges @ 1.0%				91.66
	Add CPOH @ 15.0%				1388.64
	Cost index 35.59 %				0.00
	Total with Cost index				10646.31
	Say				10646.31

ROAD RESTORATION CHARGES
1 Specification Code: od225029/2022_2023

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od225029/2022_2023 :Road Restoration Charges for BM&BC as per the directions of Engineer (PWD Road) G.O.(Ms)No.59/2020/PWD Dated, Thiruvananthapuram, 30/07/2020 Rs 4069.51 per Sqm including GST

Code	Description	Unit	Quantity	Rate	Amount
MR	RR charges vide GO of PWD Roads	sqm	1.00000	2726.69	2726.69
TOTAL					2726.69
cost for one per sqm					2726.69
	say				2726.69

	Add Water Charges @ 1.0%				27.26
	Add CPOH @ 15.0%				413.09
	Cost index 35.59 %				0.00
	Total with Cost index				3167.05
	Say				3167.05

2 Specification Code: od225034/2022_2023

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od225034/2022_2023 :Road Restoration Charges for CC roads as per the directions of Engineer (PWD Road)
G.O.(Ms)No.59/2020/PWD Dated, Thiruvananthapuram, 30/07/2020 Rs 5473.44 per Sqm including GST

Code	Description	Unit	Quantity	Rate	Amount
MR	RR charges vide GO of PWD Roads (Rate without GST, CPOH and water charges)	sqm	1.00000	3612.47	3612.47
TOTAL					3612.47
cost for one per sqm					3612.47
	say				3612.47

	Add Water Charges @ 1.0%				36.12
	Add CPOH @ 15.0%				547.28
	Cost index 35.59 %				0.00
	Total with Cost index				4195.88
	Say				4195.88

Household Connection

1 Specification Code: od225028/2022_2023

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od225028/2022_2023 :Carrying out Household Survey for Sewerage System including all Preparatory Works, Tool Preparation, Data Collection Charges, Interviews, Data Entry, Field level monitoring, Data Verification all allied works

Code	Description	Unit	Quantity	Rate	Amount
MR	Cost of Household Survey for Sewerage system	each	1.00000	64.06	64.06
TOTAL					64.06

cost for one each					64.06
	say				64.06

	Add Water Charges @ 1.0%				0.64
	Add CPOH @ 15.0%				9.70
	Cost index 35.59 %				0.00
	Total with Cost index				74.41
	Say				74.41

2 Specification Code: od225035/2022_2023

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od225035/2022_2023 :Providing sewer connection to the existing households and commercial units including the cost for all supplying and laying suitable size sewer pipeline , Demolishing cement concrete manually / by mechanical means including disposal of material , Earthwork excavation and backfilling after laying works,Constructing brick masonry chamber for underground C.I. inpection chamber and bends with bricks in cement mortar 1:4 (1 cement: 4 coarse sand) C.I.cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover with frame to be not less than 38 kg (weight of cover 23kg and weight of frame 15 kg), R.C.C top slab with 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) foundation concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement: 3 coarse sand) finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete as per standard design: Inside dimensions 455x610 mm and 45 cm deep for single pipe line: With common burnt clay F.P.S. (non modular) bricks of class designation 7.5, cement concrete levelling course 1:2:4 , including KWA sewer connection fee & Documentation charge etc complete as directed by Engineer in charge

Code	Description	Unit	Quantity	Rate	Amount
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MR	Providing sewer connection to the existing households and commercial units including the cost for all supplying and laying suitable size sewer pipeline , Demolishing cement concrete manually / by mechanical means including disposal of material , Earthwork excavation and backfilling after laying works, Constructing brick masonry chamber for underground C.I. inspection chamber and bends with bricks in cement mortar 1:4 (1 cement: 4 coarse sand) C.I.cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover with frame to be not less than 38 kg (weight of cover 23kg and weight of frame 15 kg), R.C.C top slab with 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) foundation concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement: 3 coarse sand) finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete as per standard design: Inside dimensions 455x610 mm and 45 cm deep for single pipe line: With common burnt clay F.P.S. (non modular) bricks of class designation 7.5, cement concrete levelling course 1:2:4 , including KWA sewer connection fee & Documentation charge etc complete as directed by Engineer in charge	no	1.00000	14900.62	14900.62
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TOTAL					14900.62
	cost for 1.1615 no				14900.62
	cost for one no				12828.77
	say				12828.77

	Add Water Charges @ 1.0%				128.28
	Add CPOH @ 15.0%				1943.55
	Cost index 35.59 %				0.00
	Total with Cost index				14900.62
	Say				14900.62

3 Specification Code: od225043/2022_2023

od225043/2022_2023 :Suupplying conveying and laying pipes and specials ISI marked 160mm dia uPVC SN4 pipes having including conveyence charges to stock yard , unloading charges, freight charges, taxes if any,Laying UPVC pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure including cost of pipes and specials 160 mm nominal outer dia pipes.

Code	Description	Unit	Quantity	Rate	Amount
MR	Cost of uPVC SN4 sewer pipes (MR)	per metre	1.00000	706.00	706.00
MR	Laying UPVC pipes and specials, lowering to the trenches already made, placing in position aligning the pipe line to the lines and levels and jointing the pipes and specials with solvent cement and testing the pipe line with water to the required test pressure (KWA 100.9.11)	per metre	1.00000	98.65	98.65
MR	5 % for specials, Jointnig materials Solvent cement	L.S	1.00000	40.23	40.23
TOTAL					844.88
cost for one per metre					844.88
	say				844.88

	Add Water Charges @ 1.0%				8.44
	Add CPOH @ 15.0%				127.99
	Cost index 35.59 %				0.00
	Total with Cost index				981.33
	Say				981.33

4 Specification Code: od225045/2022_2023

od225045/2022_2023 :Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly

soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.

Code	Description	Unit	Quantity	Rate	Amount
MR	Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m. TWAD	metre	1.00000	441.00	441.00
TOTAL					441.00
cost for one metre					441.00
	say				441.00

	Add Water Charges @ 1.0%				4.41
	Add CPOH @ 15.0%				66.81
	Cost index 35.59 %				0.00
	Total with Cost index				512.22
	Say				512.22

Sewer cleaning and Flushing vehicles (5nos), Jet rodding machine, Manhole silt removal and Sewer Flushing, including odour control arrangements

1 Specification Code: od225037/2022_2023

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od225037/2022_2023 :Purchasing LCV mounted sewer suction cum Jetting machine of 4000 liters tank capacity, Tank shell thickness of 5 mm, Jetting Pump Capacity of 100 lpm at a pressure of 150 Bar and

**Vacuum Pump Capacity of
5300 lpm etc with all other technical specification as specified in the NIT including transportation, Transits insurance,
Entry tax, RTO registration , Temporary registration etc. complete**

Code	Description	Unit	Quantity	Rate	Amount
MR	Purchasing LCV mounted sewer suction cum Jetting machine of 4000 liters tank capacity, Tank shell thickness of 5 mm, Jetting Pump Capacity of 100 lpm at a pressure of 150 Bar and Vacuum Pump Capacity of 5300 lpm etc with all other technical specification as specified in the NIT including transportation, Transits insurance, Entry tax, RTO registration , Temporary registration etc. complete	no	1.00000	4556258.00	4556258.00
TOTAL					4556258.00
	cost for 1.1615 no				4556258.00
	cost for one no				3922736.12
	say				3922736.12

	Add Water Charges @ 1.0%				39227.36
	Add CPOH @ 15.0%				594294.52
	Cost index 35.59 %				0.04
	Total with Cost index				4556258.05
	Say				4556258.05

2 Specification Code: od225039/2022_2023

od225039/2022_2023 :Supply, testing and commissioning Hydraulic operated cum Winch Driven De-Silting Grab Bucket System inclusive of four-wheeler of Make TATA 275 /TATA ACE or Equipment Vehicle with system having traveling depth of at least 12 m, steel grab bucket of 20litres capacity, hydraulic system

driven by vehicle engine. 8mm wire rope with appropriate size reel, with hydraulic cylinder, hydro motor, flexible hose, oil tank, hopper boom, hose of appropriate size etc. complete with valves, instruments, accessories with cost of vehicle etc. complete conforming with tender specifications- GWSSB SoR

Code	Description	Unit	Quantity	Rate	Amount
MR	Supply, testing and commissioning Hydraulic operated cum Winch Driven De-Silting Grab Bucket System inclusive of four-wheeler of Make TATA 275 /TATA ACE or Equipment Vehicle with system having traveling depth of at least 12 m, steel grab bucket of 20litres capacity, hydraulic system driven by vehicle engine. 8mm wire rope with appropriate size reel, with hydraulic cylinder, hydro motor, flexible hose, oil tank, hopper boom, hose of appropriate size etc. complete with valves, instruments, accessories with cost of vehicle etc. complete conforming with tender specifications- GWSSB SoR	set	1.00000	862597.00	862597.00
TOTAL					862597.00
	cost for 1.1615 set				862597.00
	cost for one set				742657.77
	say				742657.77

	Add Water Charges @ 1.0%				7426.57
	Add CPOH @ 15.0%				112512.65
	Cost index 35.59 %				0.00
	Total with Cost index				862597.01
	Say				862597.01

3 Specification Code: od225042/2022_2023

od225042/2022_2023 :Supplying, testing and Commissioning Jotting machinery inclusive of Four wheeler of MAKE TATA 275/TATA ACE or Equivalent vehicle with suitable RPM Triplex Plunger Pump having minimum capacity 13 LPM and minimum pressure 200 BAR directly coupled with a separate 10 HP heavy duty, 4 stoke, air cooled diesel Engine, withwater tank having capacity 500 lit, with jetting hose of 30 m length with ID 1/4",etc. complete with hose reel, spraying hose and gun, valves, instruments, accessories with cost of vehicles etc. complete conforming with tender specifications.

Code	Description	Unit	Quantity	Rate	Amount
MR	Flushing Tanker Vehicle shall be given to Flush sewers whenever necessary and access narrow roads – Supplying, testing and Commissioning Jotting machinery inclusive of Four wheeler of MAKE TATA 275/TATA ACE or Equivalent vehicle with suitable RPM Triplex Plunger Pump having minimum capacity 13 LPM and minimum pressure 200 BAR directly coupled with a separate 10 HP heavy duty, 4 stoke, air cooled diesel Engine, withwater tank having capacity 500 lit, with jetting hose of 30 m length with ID 1/4",etc. complete with hose reel, spraying hose and gun, valves, instruments, accessories with cost of vehicles etc. complete conforming with tender specifications.	set	1.00000	890423.00	890423.00
TOTAL					890423.00
	cost for 1.1615 set				890423.00
	cost for one set				766614.72
	say				766614.72

	Add Water Charges @ 1.0%				7666.14
	Add CPOH @ 15.0%				116142.13
	Cost index 35.59 %				-0.02
	Total with Cost index				890422.98
	Say				890422.98

4 Specification Code: od225046/2022_2023

od225046/2022_2023 :Providing operationg Non-Motorised Manhole cleaner: Manual Grab to scrap and collect solids from manholes with Collection bucket of not less than 6 litres having extension rod of minimum 2 m adjustable upto 3m with all allied accessories conforming to standard specifications

Code	Description	Unit	Quantity	Rate	Amount
MR	Providing operationg Non-Motorised Manhole cleaner: Manual Grab to scrap and collect solids from manholes with collection bucket of not less than 6 litres having extension rod of minimum 2 m adjustable upto 3m with all allied accessories conforming to standard specifications	set	1.00000	20000.00	20000.00
TOTAL					20000.00
	cost for 1.1615 set				20000.00
	cost for one set				17219.11
	say				17219.11

	Add Water Charges @ 1.0%				172.19
	Add CPOH @ 15.0%				2608.69
	Cost index 35.59 %				0.00
	Total with Cost index				20000.00
	Say				20000.00

5 Specification Code: od225048/2022_2023

od225048/2022_2023 :Vehicle Mounted High Pressure Jetting cum Sewer Suction Machine mounted on a vehicle of 16 T GVW Chasis with small wheel base and suitable for cleaning the Sewer Line in the lanes and by lanes in the City with tank capacity of minimum 7000 Litres having clean water and sludge collection tank

capable of efficiently working in sewer lines of diameters ranging from 200-600 mm, suitable for dislodging and removing obstruction and blockages from Sewer line by High Pressure Water Jetting System with requisite pressure take off and suctioning the sludge/slurry from sewers/ manholes through suitably dimensioned jetting hoses and nozzles aspirating the dislodged effluent and treating it in the filtration unit for recycling the liquid filtered/cleaned in multiple stages and is used for jetting purposes and transporting only the sludge to any desired disposal site for emptying the collected sludge under gravity in the tipping site with ease of cleaning, clearing and maintenance with dignity compliant to MS Act,2013, Noise & safety standards etc with all statutory norms/clearances applicable including MV Act provisions etc complete.

Code	Description	Unit	Quantity	Rate	Amount
MR	Vehicle Mounted High Pressure Jetting cum Sewer Suction Machine mounted on a vehicle of 16 T GVW Chasis with small wheel base and suitable for cleaning the Sewer Line in the lanes and by lanes in the City with tank capacity of minimum 7000 Litres having clean water and sludge collection tank capable of efficiently working in sewer lines of diameters ranging from 200-600 mm, suitable for dislodging and removing obstruction and blockages from Sewer line by High Pressure Water Jetting System with requisite pressure take off and suctioning the sludge/slurry from sewers/ manholes through suitably dimensioned jetting hoses and nozzles aspirating the dislodged effluent and treating it in the filtration unit for recycling the liquid filtered/cleaned in multiple stages and is used for jetting purposes and transporting only the sludge to any desired disposal site for emptying the collected sludge under gravity in the tipping site with ease of cleaning, clearing and maintenance with dignity compliant to MS Act,2013, Noise & safety standards etc with all statutory norms/clearances applicable including MV Act provisions etc complete.	set	1.00000	6000000.00	6000000.00
TOTAL					6000000.00
	cost for 1.1615 set				6000000.00
	cost for one set				5165733.96
	say				5165733.96

	Add Water Charges @ 1.0%				51657.33
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	Add CPOH @ 15.0%				782608.69
	Cost index 35.59 %				0.00
	Total with Cost index				5999999.99
	Say				5999999.99

6 Specification Code: od242912/2022_2023

od242912/2022_2023 :Vehicle Mounted High Pressure Jetting cum Sewer Suction Machine chassis mounted on a vehicle of 9 T GVW having clean water and sludge collection tank of minimum 7000 l capacity capable of efficiently working in sewer lines of diameters ranging from 200-600 mm, suitable for dislodging and removing obstruction and blockages from Sewer line by High Pressure Water Jetting System with requisite pressure take off and suctioning the sludge/slurry from sewers/ manholes through suitably dimensioned jetting hoses and nozzles aspirating the dislodged effluent and transporting the same to any desired disposal site for emptying the collected sludge under gravity in the tipping site with ease of maintenance and dignity in cleaning, clearing in compliance with to Manual Scavenging Act,2013, applicable Noise Pollution (Regulation and Control) Rules 2000, safety standards statutory norms/clearances/and MV Act,2019 provisions including Advanced Odour Control arrangements (2 nos) including suction hoses, hydraulic system, control units, valves and accessories as per sturdy standards and specifications and commissioning etc complete

Code	Description	Unit	Quantity	Rate	Amount
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MR	Vehicle Mounted High Pressure Jetting cum Sewer Suction Machine chassis mounted on a vehicle of 9 T GVW having clean water and sludge collection tank of minimum 7000 l capacity capable of efficiently working in sewer lines of diameters ranging from 200-600 mm, suitable for dislodging and removing obstruction and blockages from Sewer line by High Pressure Water Jetting System with requisite pressure take off and suctioning the sludge/slurry from sewers/ manholes through suitably dimensioned jetting hoses and nozzles aspirating the dislodged effluent and transporting the same to any desired disposal site for emptying the collected sludge under gravity in the tipping site with ease of maintenance and dignity in cleaning, clearing in compliance with to Manual Scavenging Act,2013, applicable Noise Pollution (Regulation and Control) Rules, 2000, safety standards statutory norms/clearances/and MV Act,2019 provisions including Advanced Odour Control arrangements (2 nos) including suction hoses, hydraulic system, control units, valves and accessories as per sturdy standards and specifications and commissioning etc complete	set	1.00000	5000000.00	5000000.00
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Other Engineering Organisations TOTAL					5000000.00
	cost for 1.1615 set				5000000.00
	cost for one set				4304778.30
	say				4304778.30

	Add Water Charges @ 1.0%				43047.78
	Add CPOH @ 15.0%				652173.91
	Cost index 35.59 %				0.00
	Total with Cost index				5000000.00
	Say				5000000.00



Other Engineering Organisations

PRICE

**Sewerage Scheme- Construction of wet well 1(Kaloor well) (Block 12A) , Grit
/Screen Chamber and connected works at Elamkulam STP**

General Abstract

(Dsor year: **2018**, Cost Index Applied for this estimate is **35.59%**)

SI No	Heading Description	Amount
1	Colletion well 4m dia	1773566.88
2	Grit/Screen Chamber 3m dia	1476287.57
3	Silt Pit 1.5mx1.5mx1.2m	83922.07
4	Valve chamber 1.9mx3.6mx1.7m	204194.36
5	Pumpsets	737233.10
6	Construction of pump room	1017340.19
7	Construction of RCC column & Erection of ISMB	56741.76
8	Cost for Generator pedestal & mounting structure with roof sheet.	100000.00
9	odour controll unit OCU capacity-WW1: 750 m3 /hr	1098000.00
Provision for GST payments (in %) @		0.0%
Amount reserved for GST payments		0.00
Total		6547286.00
Lumpsum for round off		714.00
		TOTAL Rs 6548000.00
		Rounded Total Rs 65,48,000
Other Engineering Organisations		Rupees Sixty Five Lakh Forty Eight Thousand Only

(Cost Index Applied for this estimate is 35.59%)

PRICE

Sewerage Scheme- Construction of wet well 1(Kaloor well) (Block 12A) , Grit /Screen Chamber and connected works at Elamkulam STP

Abstract Estimate

(Dsor year: **2018**, Cost Index Applied for this estimate is **35.59%**)

1 Colletion well 4m dia		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		56.520 cum
Say 56.520 cum @ Rs 214.03 / cum		Rs 12096.98
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		14.130 cum
Say 14.130 cum @ Rs 106.37 / cum		Rs 1503.01
3	od226249/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (For 4m diameter)	
Net Total Quantity		1.000 metre
Say 1.000 metre @ Rs 18118.68 / metre		Rs 18118.68
4	od226252/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (For 4m diameter)	
Net Total Quantity		1.500 metre
Say 1.500 metre @ Rs 19115.97 / metre		Rs 28673.96
5	od226254/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (4m diameter)	
Net Total Quantity		1.500 metre
Say 1.500 metre @ Rs 20114.73 / metre		Rs 30172.10

6	od226256/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (4m diameter)	
Net Total Quantity		0.930 metre
Say 0.930 metre @ Rs 21112.02 / metre		Rs 19634.18
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		236.219 sqm
Say 236.219 sqm @ Rs 249.69 / sqm		Rs 58981.52
8	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		49.873 cum
Say 49.873 cum @ Rs 9413.54 / cum		Rs 469481.48
9	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
Net Total Quantity		7.065 cum
Say 7.065 cum @ Rs 11065.64 / cum		Rs 78178.75
10	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		56.938 cum
Say 56.938 cum @ Rs 82.10 / cum		Rs 4674.61
11	od226258/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	

Net Total Quantity		56.938 cum
Say 56.938 cum @ Rs 1916.05 / cum		Rs 109096.05
12	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
Net Total Quantity		3.140 cum
Say 3.140 cum @ Rs 7990.86 / cum		Rs 25091.30
13	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		265.330 kilogram
Say 265.330 kilogram @ Rs 101.29 / kilogram		Rs 26875.28
14	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		4.769 cum
Say 4.769 cum @ Rs 7211.15 / cum		Rs 34389.97
15	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		6998.277 kilogram
Say 6998.277 kilogram @ Rs 98.30 / kilogram		Rs 687930.63
16	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
Net Total Quantity		349.914 sqm
Say 349.914 sqm @ Rs 223.32 / sqm		Rs 78142.79
17	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		31.400 cum
Say 31.400 cum @ Rs 258.57 / cum		Rs 8119.10

18	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
Net Total Quantity		23.000 each
Say 23.000 each @ Rs 545.00 / each		Rs 12535.00
19	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whitening	
Net Total Quantity		22.766 sqm
Say 22.766 sqm @ Rs 45.29 / sqm		Rs 1031.07
20	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		574.676 kg
Say 574.676 kg @ Rs 119.79 / kg		Rs 68840.44
Other Engineering Organisations 2 Grit/Screen Chamber 3m dia		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		40.836 cum
Say 40.836 cum @ Rs 214.03 / cum		Rs 8740.13
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		10.209 cum
Say 10.209 cum @ Rs 106.37 / cum		Rs 1085.93
3	od226248/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m	

Net Total Quantity		1.000 metre
Say 1.000 metre @ Rs 10859.75 / metre		Rs 10859.75
4	od226251/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m	
Net Total Quantity		1.500 metre
Say 1.500 metre @ Rs 11469.39 / metre		Rs 17204.09
5	od247185/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 4.5m to 6.0m (R1)	
Net Total Quantity		1.200 metre
Say 1.200 metre @ Rs 12078.90 / metre		Rs 14494.68
6	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		155.314 sqm
Say 155.314 sqm @ Rs 249.69 / sqm		Rs 38780.35
7	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		30.967 cum
Say 30.967 cum @ Rs 9413.54 / cum		Rs 291509.09
8	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
Net Total Quantity		4.875 cum

Say 4.875 cum @ Rs 11065.64 / cum		Rs 53944.99
9	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		35.842 cum
Say 35.842 cum @ Rs 82.10 / cum		Rs 2942.63
10	od226258/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		35.842 cum
Say 35.842 cum @ Rs 1916.05 / cum		Rs 68675.06
11	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
Net Total Quantity		1.767 cum
Say 1.767 cum @ Rs 7990.86 / cum		Rs 14119.85
12	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		206.958 kilogram
Say 206.958 kilogram @ Rs 101.29 / kilogram		Rs 20962.78
13	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		2.120 cum
Say 2.120 cum @ Rs 7211.15 / cum		Rs 15287.64
14	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Hard drawn steel wire fabric	
Net Total Quantity		4408.238 kilogram
Say 4408.238 kilogram @ Rs 108.47 / kilogram		Rs 478161.58
15	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On steel work	
Net Total Quantity		220.412 sqm

Say 220.412 sqm @ Rs 223.32 / sqm		Rs 49222.41
16	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		26.706 cum
Say 26.706 cum @ Rs 258.57 / cum		Rs 6905.37
17	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
Net Total Quantity		19.000 each
Say 19.000 each @ Rs 545.00 / each		Rs 10355.00
18	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
Net Total Quantity		17.121 sqm
Say 17.121 sqm @ Rs 45.29 / sqm		Rs 775.41
19	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		1035.227 kg
Say 1035.227 kg @ Rs 119.79 / kg		Rs 124009.84
20	od247490/2022_2023 Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangement and hand wheel fitted in well. 	
Net Total Quantity		1.000 each
Say 1.000 each @ Rs 248251.00 / each		Rs 248251.00
3 Silt Pit 1.5mx1.5mx1.2m		

1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		12.936 cum
Say 12.936 cum @ Rs 214.03 / cum		Rs 2768.69
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		1.176 cum
Say 1.176 cum @ Rs 106.37 / cum		Rs 125.09
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
Net Total Quantity		1.176 cum
Say 1.176 cum @ Rs 2298.93 / cum		Rs 2703.54
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		0.485 cum
Say 0.485 cum @ Rs 7211.15 / cum		Rs 3497.41
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		3.043 cum
Say 3.043 cum @ Rs 9413.54 / cum		Rs 28645.40
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		3.043 cum
Say 3.043 cum @ Rs 82.10 / cum		Rs 249.83

7	od226258/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		3.043 cum
Say 3.043 cum @ Rs 1916.05 / cum		Rs 5830.54
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		304.300 kilogram
Say 304.300 kilogram @ Rs 98.30 / kilogram		Rs 29912.69
9	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
Net Total Quantity		15.459 sqm
Say 15.459 sqm @ Rs 223.32 / sqm		Rs 3452.30
10	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		21.250 sqm
Say 21.250 sqm @ Rs 249.69 / sqm		Rs 5305.91
11	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		5.533 cum
Say 5.533 cum @ Rs 258.57 / cum		Rs 1430.67
4 Valve chamber 1.9mx3.6mx1.7m		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		35.475 cum
Say 35.475 cum @ Rs 214.03 / cum		Rs 7592.71
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		10.725 cum

Say 10.725 cum @ Rs 106.37 / cum		Rs 1140.82
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
Net Total Quantity		2.475 cum
Say 2.475 cum @ Rs 2298.93 / cum		Rs 5689.85
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		1.667 cum
Say 1.667 cum @ Rs 7211.15 / cum		Rs 12020.99
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		8.046 cum
Say 8.046 cum @ Rs 9413.54 / cum		Rs 75741.34
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		8.046 cum
Say 8.046 cum @ Rs 82.10 / cum		Rs 660.58
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		804.600 kilogram
Say 804.600 kilogram @ Rs 98.30 / kilogram		Rs 79092.18
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		42.961 sqm
Say 42.961 sqm @ Rs 249.69 / sqm		Rs 10726.93

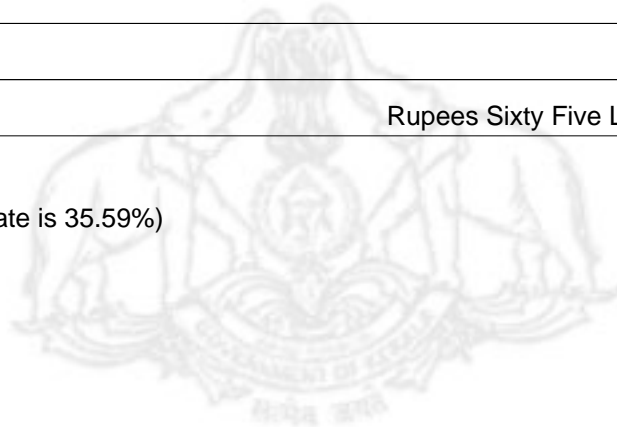
9	5.9.2 Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, buttersesses, plinth and string courses etc.	
Net Total Quantity		2.556 sqm
Say 2.556 sqm @ Rs 717.20 / sqm		Rs 1833.16
10	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide	
Net Total Quantity		14.200 metre
Say 14.200 metre @ Rs 203.93 / metre		Rs 2895.81
11	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		13.652 cum
Say 13.652 cum @ Rs 258.57 / cum		Rs 3530.00
12	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
Net Total Quantity		6.000 each
Say 6.000 each @ Rs 545.00 / each		Rs 3270.00
5 Pumpsets		
1	od235677/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 15 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years	
Net Total Quantity		1.000 each set
Say 1.000 each set @ Rs 315957.04 / each set		Rs 315957.04

2	od247474/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 10 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years	
Net Total Quantity		2.000 each set
Say 2.000 each set @ Rs 210638.03 / each set		Rs 421276.06
6 Construction of pump room		
1	od248144/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in verified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.	
Net Total Quantity		28.812 sqm
Say 28.812 sqm @ Rs 35309.60 / sqm		Rs 1017340.20
7 Construction of RCC column & Erection of ISMB		
1	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
Net Total Quantity		0.360 cum
Say 0.360 cum @ Rs 11065.64 / cum		Rs 3983.63
2	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		0.360 cum
Say 0.360 cum @ Rs 82.10 / cum		Rs 29.56

3	od248149/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		0.360 cum
Say 0.360 cum @ Rs 1916.05 / cum		Rs 689.78
4	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts	
Net Total Quantity		6.000 sqm
Say 6.000 sqm @ Rs 863.64 / sqm		Rs 5181.84
5	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		36.000 kilogram
Say 36.000 kilogram @ Rs 98.30 / kilogram		Rs 3538.80
6	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
Net Total Quantity		11.162 sqm
Say 11.162 sqm @ Rs 223.32 / sqm		Rs 2492.70
7	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
Net Total Quantity		7.380 sqm
Say 7.380 sqm @ Rs 401.21 / sqm		Rs 2960.93
8	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
Net Total Quantity		7.380 sqm
Say 7.380 sqm @ Rs 45.29 / sqm		Rs 334.24
9	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		206.781 kg
Say 206.781 kg @ Rs 119.79 / kg		Rs 24770.30
10	od248166/2022_2023 Charges for chain pulley block with travelling trolley of 1 Tonne capacity	
Net Total Quantity		1.000 each

Say 1.000 each @ Rs 12760.00 / each		Rs 12760.00
8 Cost for Generator pedestal & mounting structure with roof sheet.		
Lump-Sum Total		Rs 100000.00
9 odour controll unit OCU capacity-WW1: 750 m3 /hr		
Lump-Sum Total		Rs 1098000.00
Provision for GST payments (in %) @		0.0%
Amount reserved for GST payments		0.00
Total		6547286.00
Lumpsum for round off		714.00
TOTAL Rs 6548000.00		
Rounded Total Rs 65,48,000		
Rupees Sixty Five Lakh Forty Eight Thousand Only		

(Cost Index Applied for this estimate is 35.59%)



Other Engineering Organisations

PRICE

**Sewerage Scheme- Construction of wet well 1(Kaloor well) (Block 12A) , Grit
/Screen Chamber and connected works at Elamkulam STP**

Detailed Estimate

(Dsor year: **2018**, Cost Index Applied for this estimate is **35.59%**)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
1 Colletion well 4m dia								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	First depth 0 to 1.5m	3.14/4	6.000	6.000	1.500		42.390	
	Second depth 1.5m to 2m	3.14/4	6.000	6.000	0.500		14.130	
	Total Quantity						56.520 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						56.520 cum	
	Say 56.520 cum @ Rs 214.03 / cum						Rs 12096.98	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
	For Earth work 1.5m to 2m	1*3.14/4	6.000	6.000	0.500		14.130	
	Total Quantity						14.130 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						14.130 cum	
	Say 14.130 cum @ Rs 106.37 / cum						Rs 1503.01	
3	od226249/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (For 4m diameter)							
		1	1.000				1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 18118.68 / metre						Rs 18118.68	

4	od226252/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (For 4m diameter)							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 19115.97 / metre						Rs 28673.96	
5	od226254/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (4m diameter)							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 20114.73 / metre						Rs 30172.10	
6	od226256/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (4m diameter)							
		1			0.930		0.930	
	Total Quantity						0.930 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.930 metre	
	Say 0.930 metre @ Rs 21112.02 / metre						Rs 19634.18	
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Upto 1m above and 3m below GL -well Kerb - inner	1*3.14	4.000	0.500			6.280	
	well Kerb - outer	1*3.14	5.150	1.050			16.980	
	well Kerb - Slope	1*3.14	4+4.43		0.700		18.530	

	Side wall	1*3.14	2.000	4.500	6.880		194.429	
	Total Quantity						236.219 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						236.219 sqm	
	Say 236.219 sqm @ Rs 249.69 / sqm						Rs 58981.52	
8	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	4.000	4.000	0.500		6.280	
	From 1.5m to 4.5m below ground level-kerb	2.05					2.050	$((0.575*0.5)+(0.15*0.55)+(0.5*(0.575-0.15)*0.55))*14.4=2.05$
	Side wall	3.14	4.500	0.500	5.880		41.543	$((0.575*0.5)+(0.15*0.55)+(0.5*(0.575-0.15)*0.55))*14.4=2.05$
	Total Quantity						49.873 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						49.873 cum	
	Say 49.873 cum @ Rs 9413.54 / cum						Rs 469481.48	
9	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less							

	cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	3.14	4.500	0.500	1.000		7.065	
	Total Quantity						7.065 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						7.065 cum	
	Say 7.065 cum @ Rs 11065.64 / cum						Rs 78178.75	
10	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	4.000	4.000	0.500		6.280	
	From 1.5m to 4.5m below ground level-kerb	2.05					2.050	$((0.575*0.5)+(0.15*0.55)+(0.5*(0.575-0.15)*0.55))*14.4$
	Side wall	3.14	4.500	0.500	5.880		41.543	
	Side wall	3.14	4.500	0.500	1.000		7.065	
	Total Quantity						56.938 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						56.938 cum	
	Say 56.938 cum @ Rs 82.10 / cum						Rs 4674.61	
11	od226258/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	4.000	4.000	0.500		6.280	
	From 1.5m to 4.5m below ground level-kerb	2.05					2.050	$((0.575*0.5)+(0.15*0.55)+(0.5*(0.575-0.15)*0.55))*14.4$

	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	0.500	4.500	5.880		41.543	
	Side wall	3.14	4.500	0.500	1.000		7.065	
	Total Quantity						56.938 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						56.938 cum	
	Say 56.938 cum @ Rs 1916.05 / cum						Rs 109096.05	
12	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	Benching	3.14/4	4.000	4.000	0.250		3.140	
	Total Quantity						3.140 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.140 cum	
	Say 3.140 cum @ Rs 7990.86 / cum						Rs 25091.30	
13	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	5.000	16.900			265.330	
	Total Quantity						265.330 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						265.330 kilogram	
	Say 265.330 kilogram @ Rs 101.29 / kilogram						Rs 26875.28	
14	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging bottom	3.14/4	4.500	4.500	0.300		4.769	
	Total Quantity						4.769 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						4.769 cum	
	Say 4.769 cum @ Rs 7211.15 / cum						Rs 34389.97	

15	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	From 4.5m to 9.0m below ground leve-bottom slabl	3.14/4	4.000	4.000	0.500	120.0	753.600	
	From 1.5m to 4.5m below ground level-kerb	2.05				120.0	246.000	$((0.575*0.5)+(0.15*0.55)+(0.5*(0.575-0.15)*0.55))*14.4$
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	0.500	4.500	5.880	120.0	4985.064	
	Side wall	3.14	4.500	0.500	1.000	120.0	847.801	
	Wastage 2.5%	6632.468				0.03	165.812	
	Total Quantity						6998.277 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						6998.277 kilogram	
	Say 6998.277 kilogram @ Rs 98.30 / kilogram						Rs 687930.63	
16	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		6998.277				0.05	349.914	0.0508 m2/kg
	Total Quantity						349.914 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						349.914 sqm	
	Say 349.914 sqm @ Rs 223.32 / sqm						Rs 78142.79	
17	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total volume of the well	1*3.14/4	4.000	4.000	2.000		-25.120	
	First depth 0 to 1.5m	3.14/4	6.000	6.000	1.500		42.390	

	Second depth 1.5m to 2m	3.14/4	6.000	6.000	0.500		14.130	
	Total Quantity						56.520 cum	
	Total Deducted Quantity						-25.120 cum	
	Net Total Quantity						31.400 cum	
	Say 31.400 cum @ Rs 258.57 / cum						Rs 8119.10	
18	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		23					23.000	
	Total Quantity						23.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						23.000 each	
	Say 23.000 each @ Rs 545.00 / each						Rs 12535.00	
19	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	Well outer	1*3.14	5.000	1.000			15.701	
	top of wall thickness	1*3.14	4.500	0.500			7.065	
	Total Quantity						22.766 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						22.766 sqm	
	Say 22.766 sqm @ Rs 45.29 / sqm						Rs 1031.07	
20	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Area of pumping station(20sqm)							

	(33*0.58)+(17*0.28)=24.23 kg/m	1	20.000			24.23	484.600	25 x 3 flats at 30 mm spacing=3 nos@0.59, 12 x 3 flats at 60 mm spacing=17@.28
	25 x6 SS for outer frame@1.18kg/m	1*3.14	5.000			1.18	18.526	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	5.000			3.92	39.200	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	5.000			4.47	22.350	
	Misc. items for opening frame	1	10.000				10.000	
Total Quantity							574.676 kg	
Total Deducted Quantity							0.000 kg	
Net Total Quantity							574.676 kg	
Say 574.676 kg @ Rs 119.79 / kg							Rs 68840.44	
SI No	Description	No	L	B	D	CF	Quantity	Remark
2 Grit/Screen Chamber 3m dia								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	For 0 to 1.5 m	1*3.14/4	5.100	5.100	1.500		30.627	
	For 1.5m to 2 m	1*3.14/4	5.100	5.100	0.500		10.209	
Total Quantity							40.836 cum	
Total Deducted Quantity							0.000 cum	
Net Total Quantity							40.836 cum	
Say 40.836 cum @ Rs 214.03 / cum							Rs 8740.13	
2	2.26.1							

	Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
	For 1.5m to 2m	1*3.14/4	5.100	5.100	0.500		10.209	
	Total Quantity						10.209 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						10.209 cum	
	Say 10.209 cum @ Rs 106.37 / cum						Rs 1085.93	
3	od226248/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m							
		1	1.000				1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 10859.75 / metre						Rs 10859.75	
4	od226251/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 11469.39 / metre						Rs 17204.09	
5	od247185/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 4.5m to 6.0m (R1)							
		1	1.200				1.200	
	Total Quantity						1.200 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.200 metre	
	Say 1.200 metre @ Rs 12078.90 / metre						Rs 14494.68	

6	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Well kerb inner	1*3.14	3.000	0.450			4.240	
	Well kerb outer	1*3.14	4.050	1.050			13.353	
	Well kerb Slope	1*3.14	3.000+3.3 8		0.710		14.224	
	Side wall	1*3.14	2.000	3.450	5.700		123.497	
	Total Quantity						155.314 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						155.314 sqm	
	Say 155.314 sqm @ Rs 249.69 / sqm						Rs 38780.35	
7	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	
	Well kerb	1	11.070	0.525	0.450		2.616	Circum=3.14*3.53=11.07
		1	11.070	0.150	0.600		0.997	Circum=3.14*3.53=11.07
		1*5	11.070	0.380	0.600		1.262	Circum=3.14*3.53=11.07
	Side Wall	3.14	3.450	0.450	4.700		22.912	Circum=3.14*3.53=11.07
	Total Quantity						30.967 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						30.967 cum	
	Say 30.967 cum @ Rs 9413.54 / cum						Rs 291509.09	
8	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement							

	concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	1*3.14	3.450	0.450	1.000		4.875	
	Total Quantity							4.875 cum
	Total Deducted Quantity							0.000 cum
	Net Total Quantity							4.875 cum
	Say 4.875 cum @ Rs 11065.64 / cum							Rs 53944.99
9	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	
	Well kerb	1	11.070	0.525	0.450		2.616	Circum=3.14*3.53=11.07
		1	11.070	0.150	0.600		0.997	Circum=3.14*3.53=11.07
		1*5	11.070	0.380	0.600		1.262	Circum=3.14*3.53=11.07
	Side Wall	3.14	3.450	0.450	4.700		22.912	Circum=3.14*3.53=11.07
	Side wall	1*3.14	3.450	0.450	1.000		4.875	
	Total Quantity							35.842 cum
	Total Deducted Quantity							0.000 cum
	Net Total Quantity							35.842 cum
	Say 35.842 cum @ Rs 82.10 / cum							Rs 2942.63
10	od226258/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	

	Well kerb	1	11.070	0.525	0.450		2.616	Circum=3. 14*3.53=1 1.07
		1	11.070	0.150	0.600		0.997	Circum=3. 14*3.53=1 1.07
		1*5	11.070	0.380	0.600		1.262	Circum=3. 14*3.53=1 1.07
	Side Wall	3.14	3.450	0.450	4.700		22.912	Circum=3. 14*3.53=1 1.07
	Side wall	1*3.14	3.450	0.450	1.000		4.875	
	Total Quantity							35.842 cum
	Total Deducted Quantity							0.000 cum
	Net Total Quantity							35.842 cum
	Say 35.842 cum @ Rs 1916.05 / cum							Rs 68675.06
11	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	Benching	1*3.14/4	3.000	3.000	0.250		1.767	
	Total Quantity							1.767 cum
	Total Deducted Quantity							0.000 cum
	Net Total Quantity							1.767 cum
	Say 1.767 cum @ Rs 7990.86 / cum							Rs 14119.85
12	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	3.900	16.900			206.958	
	Total Quantity							206.958 kilogram
	Total Deducted Quantity							0.000 kilogram
	Net Total Quantity							206.958 kilogram
	Say 206.958 kilogram @ Rs 101.29 / kilogram							Rs 20962.78
13	4.1.6							

	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging the bottom of the well	1*3.14/4	3.000	3.000	0.300		2.120	
	Total Quantity						2.120 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.120 cum	
	Say 2.120 cum @ Rs 7211.15 / cum						Rs 15287.64	
14	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric							
	B o t t o m slab@120kg/m3 of concrete	1*3.14	1.500	1.500	0.450	120.0	381.510	
	Well kerb@120kg/m3 of concrete	1	11.070	0.525	0.450	120.0	313.835	Circum=3.14*3.53=11.07
	@ 120 kg / m 3 of concrete	1	11.070	0.150	0.600	120.0	119.556	Circum=3.14*3.53=11.07
	@ 120 kg / m 3 of concrete	1*5	11.070	0.380	0.600	120.0	151.438	Circum=3.14*3.53=11.07
	Side Wall@120kg/m3 of concrete	3.14	3.450	0.450	4.700	120.0	2749.416	Circum=3.14*3.53=11.07
	Side wall@120kg/m3 of concrete	1*3.14	3.450	0.450	1.000	120.0	584.983	
	wastage at 2.5%	4300			2.5/100		107.500	
	Total Quantity						4408.238 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						4408.238 kilogram	
	Say 4408.238 kilogram @ Rs 108.47 / kilogram						Rs 478161.58	
15	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							

		4408.238				0.05	220.412	0.0508 m2/kg
	Total Quantity						220.412 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						220.412 sqm	
	Say 220.412 sqm @ Rs 223.32 / sqm						Rs 49222.41	
16	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Earthwork Qty as per item 1	1	40.836				40.836	
	Volume of well	1*3.14/4	3.000	3.000	2.000		-14.130	
	Total Quantity						40.836 cum	
	Total Deducted Quantity						-14.130 cum	
	Net Total Quantity						26.706 cum	
	Say 26.706 cum @ Rs 258.57 / cum						Rs 6905.37	
17	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		19					19.000	
	Total Quantity						19.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						19.000 each	
	Say 19.000 each @ Rs 545.00 / each						Rs 10355.00	
18	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	Well outer	1	3.140	3.900	1.000		12.246	
	Wall top	1	3.140	3.450	0.450		4.875	
	Total Quantity						17.121 sqm	

	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						17.121 sqm	
	Say 17.121 sqm @ Rs 45.29 / sqm						Rs 775.41	
19	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Area of slant screen(3*1.9)=5.7sqm							
	weight	29	5.700			3.92	647.976	
	50 x 10mm SS for outer frame @ 3.92Kg/m	1	(3+1.9)*2			3.92	38.417	
	Area of pumping station 12sqm							
	25 x 3 flats at 30 mm spacing@ .58kg/m	33	12.000			0.59	233.640	
	12 x 3 flats at 60 mm spacing	17	12.000			0.28	57.121	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.900			3.92	30.576	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	1.800			4.47	8.046	
	Misc. items for opening frame	1	5.000				5.000	
	25 x6 SS for outer frame	3.14	3.900			1.18	14.451	@1.18kg/m
	Total Quantity						1035.227 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						1035.227 kg	
	Say 1035.227 kg @ Rs 119.79 / kg						Rs 124009.84	
20	od247490/2022_2023 Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangment and hand wheel fitted in well. 							
		1					1.000	
	Total Quantity						1.000 each	

Total Deducted Quantity							0.000	each
Net Total Quantity							1.000	each
Say 1.000 each @ Rs 248251.00 / each							Rs 248251.00	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
3 Silt Pit 1.5mx1.5mx1.2m								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	2.800	2.800	1.650		12.936	
	Total Quantity						12.936	cum
	Total Deducted Quantity						0.000	cum
	Net Total Quantity						12.936	cum
	Say 12.936 cum @ Rs 214.03 / cum						Rs 2768.69	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
		1	2.800	2.800	0.150		1.176	
	Total Quantity						1.176	cum
	Total Deducted Quantity						0.000	cum
	Net Total Quantity						1.176	cum
	Say 1.176 cum @ Rs 106.37 / cum						Rs 125.09	
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	2.800	2.800	0.150		1.176	
	Total Quantity						1.176	cum
	Total Deducted Quantity						0.000	cum
	Net Total Quantity						1.176	cum
	Say 1.176 cum @ Rs 2298.93 / cum						Rs 2703.54	
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	2.200	2.200	0.100		0.485	

	Total Quantity						0.485 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.485 cum	
	Say 0.485 cum @ Rs 7211.15 / cum						Rs 3497.41	
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 9413.54 / cum						Rs 28645.40	
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 82.10 / cum						Rs 249.83	
7	od226258/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	

		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 1916.05 / cum						Rs 5830.54	
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more							
	100Kg/m3 of concrete	1	3.043	100.000			304.300	
	Total Quantity						304.300 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						304.300 kilogram	
	Say 304.300 kilogram @ Rs 98.30 / kilogram						Rs 29912.69	
9	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On steel work							
	@0.0508sqm/kg	304.300				0.05	15.459	
	Total Quantity						15.459 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						15.459 sqm	
	Say 15.459 sqm @ Rs 223.32 / sqm						Rs 3452.30	
10	5.9.12 Centering and shuttering including strutting, etc. and removal of form for: Well steining							
	Base slab side	4	2.000		0.200		1.600	
	Inner side	4	1.500		1.200		7.200	
	Outer side	4	2.000		1.200		9.600	
	Baffle wall	2	1.500		0.950		2.850	
	Total Quantity						21.250 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						21.250 sqm	
	Say 21.250 sqm @ Rs 249.69 / sqm						Rs 5305.91	
11	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not							

	exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total Excavation Item 1	1	12.936				12.936	
	Sand filling item 2	1	1.176				-1.176	
	PCC item3	1	0.485				-0.485	
	RCC item5	1	3.043				-3.043	
	Pit size	1	1.500	1.500	1.200		-2.699	
	Total Quantity						12.936 cum	
	Total Deducted Quantity						-7.403 cum	
	Net Total Quantity						5.533 cum	
	Say 5.533 cum @ Rs 258.57 / cum						Rs 1430.67	
SI No	Description	No	L	B	D	CF	Quantity	Remark
4 Valve chamber 1.9mx3.6mx1.7m								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	3.300	5.000	2.150		35.475	
	Total Quantity						35.475 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						35.475 cum	
	Say 35.475 cum @ Rs 214.03 / cum						Rs 7592.71	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
		1	3.300	5.000	0.650		10.725	
	Total Quantity						10.725 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						10.725 cum	
	Say 10.725 cum @ Rs 106.37 / cum						Rs 1140.82	
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	3.300	5.000	0.150		2.475	

	Total Quantity						2.475 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.475 cum	
	Say 2.475 cum @ Rs 2298.93 / cum						Rs 5689.85	
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	3.400	4.900	0.100		1.667	
	Total Quantity						1.667 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.667 cum	
	Say 1.667 cum @ Rs 7211.15 / cum						Rs 12020.99	
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Raft	1	2.700	4.400	0.200		2.377	
	Walls	2	2.300	0.200	1.700		1.564	
		2	3.600	0.200	1.700		2.449	
	slab	1	2.300	4.000	0.180		1.656	
	Total Quantity						8.046 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						8.046 cum	
	Say 8.046 cum @ Rs 9413.54 / cum						Rs 75741.34	
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Raft	1	2.700	4.400	0.200		2.377	
	Walls	2	2.300	0.200	1.700		1.564	
		2	3.600	0.200	1.700		2.449	
	slab	1	2.300	4.000	0.180		1.656	

	Total Quantity						8.046 cum
	Total Deducted Quantity						0.000 cum
	Net Total Quantity						8.046 cum
	Say 8.046 cum @ Rs 82.10 / cum						Rs 660.58
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more						
	@ 100kg per m ³ concrete	1	8.046	100.000			804.600
	Total Quantity						804.600 kilogram
	Total Deducted Quantity						0.000 kilogram
	Net Total Quantity						804.600 kilogram
	Say 804.600 kilogram @ Rs 98.30 / kilogram						Rs 79092.18
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for: Well steining						
	Raft	2	2.700		0.200		1.080
		2		4.400	0.200		1.761
	Walls outer	2	2.300		1.700		7.820
		2		4.000	1.700		13.600
	Walls inner	2	1.900		1.700		6.460
		2		3.600	1.700		12.240
	Total Quantity						42.961 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						42.961 sqm
	Say 42.961 sqm @ Rs 249.69 / sqm						Rs 10726.93
9	5.9.2 Centering and shuttering including strutting, etc. and removal of form for: Walls (any thickness) including attached pilasters, buttresses, plinth and string courses etc.						
	Cover slab	2	2.800		0.180		1.008
		2	4.300		0.180		1.548
	Total Quantity						2.556 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						2.556 sqm
	Say 2.556 sqm @ Rs 717.20 / sqm						Rs 1833.16
10	5.9.16.1						

	Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide							
	Cover slab	2	2.800+4.3				14.200	
	Total Quantity						14.200 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						14.200 metre	
	Say 14.200 metre @ Rs 203.93 / metre						Rs 2895.81	
11	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total excavated earth Item 1	1	35.480				35.480	
	Sand filling Item 2	1	2.480				-2.480	
	PCC item 3	1	1.330				-1.330	
	RCC item 4	1	6.390				-6.390	
	Chamber size	1	1.900	3.600	1.700		-11.628	
	Total Quantity						35.480 cum	
	Total Deducted Quantity						-21.828 cum	
	Net Total Quantity						13.652 cum	
	Say 13.652 cum @ Rs 258.57 / cum						Rs 3530.00	
12	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		6					6.000	
	Total Quantity						6.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						6.000 each	
	Say 6.000 each @ Rs 545.00 / each						Rs 3270.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
5 Pumpsets								

1	od235677/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 15 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years							
		1					1.000	
	Total Quantity						1.000 each set	
	Total Deducted Quantity						0.000 each set	
	Net Total Quantity						1.000 each set	
	Say 1.000 each set @ Rs 315957.04 / each set						Rs 315957.04	
2	od247474/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 10 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years							
		2					2.000	
	Total Quantity						2.000 each set	
	Total Deducted Quantity						0.000 each set	
	Net Total Quantity						2.000 each set	
	Say 2.000 each set @ Rs 210638.03 / each set						Rs 421276.06	
SI No	Description	No	L	B	D	CF	Quantity	Remark
6 Construction of pump room								
1	od248144/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in verified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.							

		1	6.460	4.460			28.812	
	Total Quantity						28.812 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						28.812 sqm	
	Say 28.812 sqm @ Rs 35309.60 / sqm						Rs 1017340.20	
SI No	Description	No	L	B	D	CF	Quantity	Remark
7 Construction of RCC column & Erection of ISMB								
1	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Upto 1.5m from G.L above G.L for column	2	0.200	0.300	0.500		0.060	
	1.5m to 4.5m above G.L above 1.5m from G.L for column	2	0.200	0.300	2.500		0.300	
	Total Quantity						0.360 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.360 cum	
	Say 0.360 cum @ Rs 11065.64 / cum						Rs 3983.63	
2	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Upto 1.5m from G.L above G.L for column	2	0.200	0.300	0.500		0.060	
	1.5m to 4.5m above G.L above 1.5m from G.L for column	2	0.200	0.300	2.500		0.300	
	Total Quantity						0.360 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.360 cum	
	Say 0.360 cum @ Rs 82.10 / cum						Rs 29.56	

3	od248149/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Upto 1.5m from G.L above G.L for column	2	0.200	0.300	0.500		0.060	
	1.5m to 4.5m above G.L above 1.5m from G.L for column	2	0.200	0.300	2.500		0.300	
	Total Quantity						0.360 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.360 cum	
	Say 0.360 cum @ Rs 1916.05 / cum						Rs 689.78	
4	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts							
	Up to 3m from G.L for column	4	0.300		2.000		2.400	
		4	0.200		2.000		1.600	
	Above 3m to 4m	4	0.300		1.000		1.200	
		4	0.200		1.000		0.800	
	Total Quantity						6.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						6.000 sqm	
	Say 6.000 sqm @ Rs 863.64 / sqm						Rs 5181.84	
5	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
		1	0.360	100.000			36.000	
	Total Quantity						36.000 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						36.000 kilogram	
	Say 36.000 kilogram @ Rs 98.30 / kilogram						Rs 3538.80	
6	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		36	0.0508				1.829	

		1	3.900		0.250		0.975	
		2	3.900	0.130			1.014	
		1	7.200		0.600		4.320	
		2	7.200	0.210			3.024	
	Total Quantity						11.162 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						11.162 sqm	
	Say 11.162 sqm @ Rs 223.32 / sqm						Rs 2492.70	
7	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Sides	8	0.300		3.000		7.200	
		2	0.300	0.300			0.180	
	Total Quantity						7.380 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						7.380 sqm	
	Say 7.380 sqm @ Rs 401.21 / sqm						Rs 2960.93	
8	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whitening							
	Sides	8	0.300		3.000		7.200	
		2	0.300	0.300			0.180	
	Total Quantity						7.380 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						7.380 sqm	
	Say 7.380 sqm @ Rs 45.29 / sqm						Rs 334.24	
9	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Supply and fixing ISMB 300mm of 42.2kg/m for 4.9m on column over screen/grit well	1	42.200	4.900			206.781	
	Total Quantity						206.781 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						206.781 kg	

	Say 206.781 kg @ Rs 119.79 / kg						Rs 24770.30	
10	od248166/2022_2023 Charges for chain pulley block with travelling trolley of 1 Tonne capacity							
		1					1.000	
	Total Quantity						1.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						1.000 each	
	Say 1.000 each @ Rs 12760.00 / each						Rs 12760.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
8 Cost for Generator pedestal & mounting structure with roof sheet.								
Lump-Sum Total						Rs 100000.00		
	SI No	Description	No	L	B	D	CF	Quantity
Remark	9 odour controll unit OCU capacity-WW1: 750 m3 /hr							
Lump-Sum Total						Rs 1098000.00		
	Provision for GST payments (in %) @						0.0%	
Amount reserved for GST payments						0.00		
Total						6547286.00		
Lumpsum for round off						714.00		
Other Engineering Organisations						TOTAL Rs 6548000.00		
PRICE						Rounded Total Rs 65,48,000		
Rupees Sixty Five Lakh Forty Eight Thousand Only								

(Cost Index Applied for this estimate is 35.59%)

Data Analysis

Colletion well 4m dia					
1 Specification Code: 2.6.1					

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89
TOTAL					1578.52
Cost of 10.0 cum					1578.52
Cost per cum					157.85
Say					157.85

	Cost index	35.59 %			56.18
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	Total with Cost index				214.03
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2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
TOTAL					675.50
Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

	Cost index 35.59 %				27.92
	Total with Cost index				106.37

3 Specification Code: od226249/2022_2023

od226249/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (For 4m diameter)

Quantity for 3.0m depth=3.14*2.6*2.6*3=63.68m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPOH) 100.3.5.2 328.41*1.3559	cum	63.68000	445.29	28356.07
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	63.68000	276.83	17628.53
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					46584.60
	cost for 3.0 metre				46584.60
	cost for one metre				15528.20
	say				15528.20

	Add Water Charges @ 1.0%				155.28
	Add CPOH @ 15.0%				2352.52
	Cost index 35.59 %				82.67
	Total with Cost index				18118.68
	Say				18118.68

4 Specification Code: od226252/2022_2023

od226252/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (For 4m diameter)

Quantity for 3.0m depth= $3.14 \times 2.6^2 \times 3 = 63.68\text{m}^3$

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%= $175.78 \times 1.01 \times 1.15 \times 1.3559 = 276.83$

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.3 $358.24 \times 1.3559 = 485.74$	cum	63.68000	485.74	30931.92
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	63.68000	276.83	17628.53
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					49160.45
	cost for 3.0 metre				49160.45
	cost for one metre				16386.82
	say				16386.82

	Add Water Charges @ 1.0%				163.86
	Add CPOH @ 15.0%				2482.60
	Cost index 35.59 %				82.67
	Total with Cost index				19115.97
	Say				19115.97

5 Specification Code: od226254/2022_2023

od226254/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (4m diameter)

Quantity for 3.0m depth= $3.14 \times 2.6^2 \times 3 = 63.68\text{m}^3$

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%= $175.78 \times 1.01 \times 1.15 \times 1.3559 = 276.83$

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.4 $388.12 \times 1.3559 = 485.74$	cum	63.68000	526.25	33511.60
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	63.68000	276.83	17628.53
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					51740.13
	cost for 3.0 metre				51740.13
	cost for one metre				17246.71
	say				17246.71

	Add Water Charges @ 1.0%				172.46
	Add CPOH @ 15.0%				2612.87
	Cost index 35.59 %				82.67
	Total with Cost index				20114.73
	Say				20114.73

6 Specification Code: od226256/2022_2023

od226256/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (4m diameter)

Quantity for 3.0m depth=3.14*2.6*2.6*3=63.68m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.5 417.95*1.3559 =566.70	cum	63.68000	566.70	36087.46
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	63.68000	276.83	17628.53
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					54315.99
	cost for 3.0 metre				54315.99
	cost for one metre				18105.33
	say				18105.33

	Add Water Charges @ 1.0%				181.05
	Add CPOH @ 15.0%				2742.95
	Cost index 35.59 %				82.67
	Total with Cost index				21112.02
	Say				21112.02

7 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood $26.39 \times 0.038 = 1.00$ cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = $1200/8 = 150$ cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712$ cum Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798$ cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = $0.1586/8 = 0.0198$ cum	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = $53/8 = 6.625$ m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material $(P+Q+R)/6 = (3750.00+0.50+245.12/6)$	metre	6.625	40.00	265.00(R)
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Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations

Cost index	35.59 %		65.54
Total with Cost index			249.69

8 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1

All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00
TOTAL					5977.32

Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

Cost index 35.59 %	2470.89
Total with Cost index	9413.54

9 Specification Code: 5.33.2

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2

All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20

0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level $0.75 \times 2.5 = 1.88$	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL	7026.36
Add Water Charges @ 1%	70.26
TOTAL	7096.62
Add CPOH @ 15%	1064.49
TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

	Cost index 35.59 %				2904.54
	Total with Cost index				11065.64

10 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

11 Specification Code: od226258/2022_2023

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od226258/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

12 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				

0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

TOTAL				5073.95
Add Water Charges @ 1%				50.74
TOTAL				5124.69
Add CPOH @ 15%				768.70
TOTAL				5893.39
Cost of 1.0 cum				5893.39
Say				5893.4

Cost index		35.59 %			2097.46
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	Total with Cost index				7990.86
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13 Specification Code: 10.1

SUBHEAD : 10.0

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				
1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34
AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)					63.17
TOTAL					6512.45

AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)	957.07
TOTAL	7470.00
Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

Cost index	35.59 %				26.59
Total with Cost index					101.29

14 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31

2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL				4578.85
Add Water Charges @ 1%				45.79
TOTAL				4624.64
Add CPOH @ 15%				693.70
TOTAL				5318.34
Cost of 1.0 cum				5318.34
Say				5318.35

Cost index 35.59 %					1892.80
Total with Cost index					7211.15

15 Specification Code: 5.22.6

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6

Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
TOTAL					6241.51
Add Water Charges @ 1%					62.42
TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52
Cost per kilogram					72.50
Say					72.5

	Cost index 35.59 %				25.80
	Total with Cost index				98.30

16 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and

applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25
Cost of 10.0 sqm					1647.25

Cost per sqm	164.72
Say	164.7

Cost index 35.59 %	58.62
Total with Cost index	223.32

17 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95
Cost per cum					190.69
Say					190.7

Cost index 35.59 %	67.87
Total with Cost index	258.57

18 Specification Code: 19.16

SUBHEAD : 19.0**DRAINAGE****19.16**

Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foot rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number 4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) 1st class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
Add Water Charges @ 1% except on A ie on (354.8-62.7=292.1)					2.92

TOTAL	357.72
AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)	44.25
TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

Cost index 35.59 %	143.05
Total with Cost index	545.00

19 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whitening

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46
TOTAL					287.76

Add Water Charges @ 1%	2.88
TOTAL	290.64
Add CPOH @ 15%	43.60
TOTAL	334.24
Cost of 10.0 sqm	334.24
Cost per sqm	33.42
Say	33.4

Cost index 35.59 %	11.89
Total with Cost index	45.29

20 Specification Code: 10.2

SUBHEAD : 10.0

STEEL WORK

10.2

Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				

1007	<p>Structural steel such as tees, angles, channels and R.S. joists</p> <p>(ii) Tiles (flats) 50x12mm: $2 \times 2.7 = 5.4 \text{ m @ } 4.7 \text{ kg/m} = 25.38\text{kg}+$</p> <p>Ties central (flats): $50 \times 10\text{mm } 1 \times 2.80 = 2.8 \text{ m @ } 3.90 \text{ kg/m} = 10.92\text{kg}+$</p> <p>Braces (flats) 40x 10 mm: $2 \times 1.84 = 3.68\text{m @ } 3.9 \text{ kg/m} = 14.35 \text{ kg.}$</p> <p>Total = 50.65 kg+</p> <p>Add wastage @ 5% = 2.53kg</p> <p>Total = 53.18kg. = 0.53 qtl</p>	quintal	1.6	4600.00	7360.00
1009	<p>Flats exceeding 10 mm in thickness</p> <p>(iii) Gusset plates 10 mm thick: $1 \times 0.74 \times 0.35\text{m} = 0.259 \text{ sqm.}+$</p> <p>Shone $4 \times 0.46 \times 0.46 = 0.845 \text{ sqm.}$</p> <p>Total = 1.104 sqm.</p> <p>$1.104 \text{ sqm @ } 78.4 \text{ kg/m} = 86.55 \text{ kg}$</p> <p>12 mm plates at the point of principal rafter and strut: $2 \times 0.3 \times 0.2 = 0.12 \text{ sqm.} +$</p> <p>Tie beam, brace and strut: $2 \times 0.5 \times 0.3 = 0.30 \text{ sqm.} +$</p> <p>Sole plates: $2 \times 0.46 \times 0.46 = 0.42 \text{ sqm.}+$</p> <p>Anchor plate: $2 \times 0.46 \times 0.1 = 0.09\text{sqm.}$</p> <p>Total = 0.93 sqm. Say 1.00 sqm.</p> <p>$1.00 \text{ sqm. @ } 94.4 \text{ kg/m} = 94.40 \text{ kg.}$</p> <p>Total = 180.95 kg</p> <p>Add wastage @ 5% = 9.05 kg.</p> <p>Total = 190.00kg or 1.90 q</p>	quintal	0.53	4600.00	2438.00
1010	<p>Mild steel plates</p> <p>(iv) 16mm dia. 50 mm long rivets = 56 Nos.+</p> <p>Add wastage @ 5 % = 2.8 Nos.</p> <p>Total = 58.8 Nos.</p>	quintal	1.9	4800.00	9120.00

1020	Mild steel rivets (v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	Carriage of Steel Carriage of steel (0.160+0.053+0.091+0.099+0.007+0.005) = 0.415 tonne LABOUR:	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40
0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron 9.5 x 0.4 = 3.80 sqm. + Struts 2.70 x 0.16 = 0.43 sqm. + Ties 5.4x0.124 = 0.67 sqm. + Braces 2 x 1.84 x 0.12 = 0.44 sqm. + Ties 2.8x0.12 = 0.34 sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

AddWater Charges @ 1% except on A ie on (30081.43-249.92=29831.51)				298.32
TOTAL				30379.75
AddCPOH @ 15% except on A ie on (30379.75-249.92=30129.83)				4519.47
TOTAL				34898.25

Cost of 395.0 kg	34898.25
Cost of 1 kg	88.35
Say	88.35

Cost index	35.59 %				31.44
Total with Cost index					119.79

Grit/Screen Chamber 3m dia
1 Specification Code: 2.6.1

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63

Add CPOH @ 15%	205.89
TOTAL	1578.52
Cost of 10.0 cum	1578.52
Cost per cum	157.85
Say	157.85

Cost index 35.59 %	56.18
Total with Cost index	214.03

2 Specification Code: 2.26.1

2.26

Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
TOTAL					675.50
Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

	Cost index 35.59 %				27.92
	Total with Cost index				106.37

3 Specification Code: od226248/2022_2023

od226248/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m

Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 356.61*1.3559 =483.52	cum	35.82000	483.52	17319.69
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					27835.74
	cost for 3.0 metre				27835.74
	cost for one metre				9278.58
	say				9278.58

	Add Water Charges @ 1.0%				92.78
	Add CPOH @ 15.0%				1405.70
	Cost index 35.59 %				82.67

	Total with Cost index				10859.75
	Say				10859.75

4 Specification Code: od226251/2022_2023

od226251/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m

Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 389.02.19*1.3559 =527.48	cum	35.82000	527.48	18894.33
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					29410.38
	cost for 3.0 metre				29410.38
	cost for one metre				9803.46
	say				9803.46

	Add Water Charges @ 1.0%				98.03
	Add CPOH @ 15.0%				1485.22
	Cost index 35.59 %				82.67

	Total with Cost index				11469.39
	Say				11469.39

5 Specification Code: od247185/2022_2023

od247185/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 4.5m to 6.0m (R1)

Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.4 421.44 *1.3559 =663.71	cum	35.82000	571.43	20468.62
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					30984.67
	cost for 3.0 metre				30984.67
	cost for one metre				10328.22
	say				10328.22

	Add Water Charges @ 1.0%				103.28
	Add CPOH @ 15.0%				1564.72
	Cost index 35.59 %				82.67

	Total with Cost index				12078.90
	Say				12078.90

6 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	<p>Details of cost for 26.39 sqm</p> <p>Surface area</p> <p>Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm</p> <p>MATERIAL:</p> <p>Assuming that the timber will become unserviceable after being used 8 times</p> <p>planks 38 mm (Second class kail wood</p> <p>$26.39 \times 0.038 = 1.00$ cum</p> <p>Wastage 2% = 0.20 cum.</p> <p>Total = 1.20 cum . or 1200 cudm.</p> <p>Qty for cost using once = $1200/8 = 150$ cudm</p>				

1198	Second class kail wood in planks 2nd class kail wood battens Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712 \text{ cum}$ Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798 \text{ cum}$ Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = $0.1586/8 = 0.0198 \text{ cum}$	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside $25 \times 1.00 = 25.00 \text{ m}$ Outside $28 \times 1.00 = 28.00 \text{ m}$ Total = 53.00 m Qty for cost using once = $53/8 = 6.625 \text{ m}$ Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Cost index	35.59 %				65.54
Total with Cost index					249.69

7 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1

All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00

0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL					5977.32
Add Water Charges @ 1%					59.77
TOTAL					6037.09
Add CPOH @ 15%					905.56
TOTAL					6942.65
Cost of 1.0 cum					6942.65
Say					6942.65

Cost index 35.59 %					2470.89
Total with Cost index					9413.54

8 Specification Code: 5.33.2

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content

considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2 All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30

0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level 0.75 x 2.5 = 1.88	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL					7026.36
Add Water Charges @ 1%					70.26
TOTAL					7096.62
Add CPOH @ 15%					1064.49
TOTAL					8161.11
Cost of 1.0 cum					8161.11
Say					8161.1

	Cost index 35.59 %				2904.54
	Total with Cost index				11065.64

9 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40

2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80

TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

10 Specification Code: od226258/2022_2023

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od226258/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

11 Specification Code: 4.1.3

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3

1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90

0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

TOTAL					5073.95
Add Water Charges @ 1%					50.74
TOTAL					5124.69
Add CPOH @ 15%					768.70
TOTAL					5893.39
Cost of 1.0 cum					5893.39
Say					5893.4

Cost index 35.59 %					2097.46
Total with Cost index					7990.86

Other Engineering Organisations

12 Specification Code: 10.1

SUBHEAD : 10.0

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				

1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34

AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)					63.17
TOTAL					6512.45
AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)					957.07
TOTAL					7470.00
Cost of 100.0 kilogram					7470.00
Cost of 1 kilogram					74.70
Say					74.7

	Cost index 35.59 %				26.59
	Total with Cost index				101.29

13 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04
TOTAL					4578.85
Add Water Charges @ 1%					45.79
TOTAL					4624.64

Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

Cost index 35.59 %	1892.80
Total with Cost index	7211.15

14 Specification Code: 5.22.5

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.5 Hard drawn steel wire fabric

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Hard drawn steel wire fabric 100kg/7.75 kg = 12.903 sqm Wastage 5% = 0.64 sqm Total = 13.548 sqm				
1021	Hard drawn steel wire fabric	sqm	13.548	430.00	5825.64
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For cutting and laying in position	L.S	26.0	2.00	52.00
0103	Blacksmith 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	1.5	558.00	837.00
9999	Sundries-and binding wire	L.S	13.52	2.00	27.04

TOTAL	6887.17
Add Water Charges @ 1%	68.87
TOTAL	6956.04
Add CPOH @ 15%	1043.41
TOTAL	7999.45
Cost of 100.0 kilogram	7999.45
Cost per kilogram	79.99
Say	80.0

Cost index 35.59 %	28.47
Total with Cost index	108.47

15 Specification Code: 13.52.1

13.52

Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1

On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92

9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25
Cost of 10.0 sqm					1647.25
Cost per sqm					164.72
Say					164.7

Cost index 35.59 %					58.62
Total with Cost index					223.32

16 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				

0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40

TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95
Cost per cum					190.69
Say					190.7

	Cost index 35.59 %				67.87
	Total with Cost index				258.57

17	Specification Code: 19.16
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SUBHEAD : 19.0

DRAINAGE

19.16

Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. floor rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number 4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) 1st class	Day	0.02	738.00	14.76
0124	Mason (brick layer) 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
Add Water Charges @ 1% except on A ie on (354.8-62.7=292.1)					2.92
TOTAL					357.72
Add CPOH @ 15% except on A ie on (357.72-62.7=295.02)					44.25
TOTAL					401.95
Cost of 1.0 each					401.95
Cost of 1 each					401.95
Say					401.95

	Cost index 35.59 %				143.05
	Total with Cost index				545.00

18 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whitening

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46
Other Engineering Organisations TOTAL					287.76
Add Water Charges @ 1%					2.88
TOTAL					290.64
Add CPOH @ 15%					43.60
TOTAL					334.24
Cost of 10.0 sqm					334.24
Cost per sqm					33.42
Say					33.4

	Cost index 35.59 %				11.89
	Total with Cost index				45.29

19 Specification Code: 10.2

SUBHEAD : 10.0**STEEL WORK****10.2**

Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				
1007	Structural steel such as tees, angles, channels and R.S. joists (ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+ Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+ Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg. Total = 50.65 kg+ Add wastage @ 5% = 2.53kg Total = 53.18kg. = 0.53 qtl	quintal	1.6	4600.00	7360.00

1009	<p>Flats exceeding 10 mm in thickness</p> <p>(iii) Gusset plates 10 mm thick: $1 \times 0.74 \times 0.35 \text{m} = 0.259 \text{ sqm.} +$ Shone $4 \times 0.46 \times 0.46 = 0.845 \text{ sqm.}$ Total = 1.104 sqm. $1.104 \text{ sqm} @ 78.4 \text{ kg/m} = 86.55 \text{ kg}$ 12 mm plates at the point of principal rafter and strut: $2 \times 0.3 \times 0.2 = 0.12 \text{ sqm.} +$ Tie beam, brace and strut: $2 \times 0.5 \times 0.3 = 0.30 \text{ sqm.} +$ Sole plates: $2 \times 0.46 \times 0.46 = 0.42 \text{ sqm.} +$ Anchor plate: $2 \times 0.46 \times 0.1 = 0.09 \text{ sqm.}$ Total = 0.93 sqm. Say 1.00 sqm. $1.00 \text{ sqm.} @ 94.4 \text{ kg/m} = 94.40 \text{ kg.}$ Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00 kg or 1.90 q</p>	quintal	0.53	4600.00	2438.00
1010	<p>Mild steel plates</p> <p>(iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.</p>	quintal	1.9	4800.00	9120.00
1020	<p>Mild steel rivets</p> <p>(v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm</p>	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	<p>Carriage of Steel</p> <p>Carriage of steel $(0.160 + 0.053 + 0.091 + 0.099 + 0.007 + 0.005) =$ 0.415 tonne LABOUR:</p>	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40

0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron $9.5 \times 0.4 = 3.80$ sqm. + Struts $2.70 \times 0.16 = 0.43$ sqm. + Ties $5.4 \times 0.124 = 0.67$ sqm. + Braces $2 \times 1.84 \times 0.12 = 0.44$ sqm. + Ties $2.8 \times 0.12 = 0.34$ sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number 13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

Add Water Charges @ 1% except on A ie on (30081.43-249.92=29831.51)				298.32
TOTAL				30379.75
Add CPOH @ 15% except on A ie on (30379.75-249.92=30129.83)				4519.47
TOTAL				34898.25
Cost of 395.0 kg				34898.25
Cost of 1 kg				88.35
Say				88.35

	Cost index 35.59 %				31.44
	Total with Cost index				119.79

20 Specification Code: od247490/2022_2023

od247490/2022_2023 :Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal

seating, spindle made of Stainless steel, CI head stock with gear arrangment and hand wheel fitted in well.

Code	Description	Unit	Quantity	Rate	Amount
MR	Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangment and hand wheel fitted in well. 	each	1.00000	248251.00	248251.00
TOTAL					248251.00
	cost for 1.1615 each				248251.00
	cost for one each				213733.10
	say				213733.10

	Add Water Charges @ 1.0%				2137.33
	Add CPOH @ 15.0%				32380.56
	Cost index 35.59 %				0.00
	Total with Cost index				248251.00
	Say				248251.00

Silt Pit 1.5mx1.5mx1.2m

1 Specification Code: 2.6.1

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89
TOTAL					1578.52
Cost of 10.0 cum					1578.52
Cost per cum					157.85
Say					157.85

	Cost index 35.59 %				56.18
	Total with Cost index				214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80

TOTAL					675.50
Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

	Cost index 35.59 %			27.92
	Total with Cost index			106.37

3 Specification Code: 2.27

2.27

Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62

0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95

TOTAL					14597.33
Add Water Charges @ 1%					145.97
TOTAL					14743.30
Add CPOH @ 15%					2211.49
TOTAL					16954.79
Cost of 10.0 cum					16954.79
Cost per cum					1695.48
Say					1695.5

Cost index 35.59 %					603.43
Total with Cost index					2298.93

Other Engineering Organisations

4 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00

0295	Stone Aggregate(single size):20 mm nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL	4578.85
Add Water Charges @ 1%	45.79
TOTAL	4624.64
Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

Cost index 35.59 %	1892.80
Total with Cost index	7211.15

5 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1

All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00

0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL					5977.32
Add Water Charges @ 1%					59.77
TOTAL					6037.09
Add CPOH @ 15%					905.56
TOTAL					6942.65
Cost of 1.0 cum					6942.65
Say					6942.65

Cost index 35.59 %					2470.89
Total with Cost index					9413.54

6 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
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	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80

	TOTAL	52.12
	Add Water Charges @ 1%	.52
	TOTAL	52.64
	Add CPOH @ 15%	7.90
	TOTAL	60.54
	Cost of 1.0 cum	60.54
	Say	60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

7 Specification Code: od226258/2022_2023

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od226258/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60

TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

8 Specification Code: 5.22.6

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6

Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in position	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL	6241.51
Add Water Charges @ 1%	62.42
TOTAL	6303.93
Add CPOH @ 15%	945.59
TOTAL	7249.52
Cost of 100.0 kilogram	7249.52
Cost per kilogram	72.50
Say	72.5

Cost index 35.59 %	25.80
Total with Cost index	98.30

9 Specification Code: 13.52.1

13.52

Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1

On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92

9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25
Cost of 10.0 sqm					1647.25
Cost per sqm					164.72
Say					164.7

Cost index 35.59 %					58.62
Total with Cost index					223.32

10 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
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	<p>Details of cost for 26.39 sqm</p> <p>Surface area</p> <p>Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm</p> <p>MATERIAL:</p> <p>Assuming that the timber will become unserviceable after being used 8 times</p> <p>planks 38 mm (Second class kail wood</p> <p>$26.39 \times 0.038 = 1.00$ cum</p> <p>Wastage 2% = 0.20 cum.</p> <p>Total = 1.20 cum . or 1200 cudm.</p> <p>Qty for cost using once = $1200/8 = 150$ cudm</p>				
1198	<p>Second class kail wood in planks</p> <p>2nd class kail wood battens</p> <p>Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712$ cum</p> <p>Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798$ cum</p> <p>Total = 0.1510 cum.</p> <p>Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm</p> <p>Qty for cost using once = $0.1586/8 = 0.0198$ cum</p>	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)
0302	<p>Safeda ballies 125 mm diameter</p> <p>Inside $25 \times 1.00 = 25.00$ m</p> <p>Outside $28 \times 1.00 = 28.00$ m</p> <p>Total = 53.00 m</p> <p>Qty for cost using once = $53/8 = 6.625$ m</p> <p>Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material</p> <p>$(P+Q+R)/6 = (3750.00+0.50+245.12/6)$</p>	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Cost index	35.59 %				65.54
Total with Cost index					249.69

11 Specification Code: 2.25

2.25

Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95

Cost per cum	190.69
Say	190.7

Cost index	35.59 %				67.87
Total with Cost index					258.57

Valve chamber 1.9mx3.6mx1.7m

1 Specification Code: 2.6.1

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89

TOTAL	1578.52
Cost of 10.0 cum	1578.52
Cost per cum	157.85
Say	157.85

Cost index 35.59 %	56.18
Total with Cost index	214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
TOTAL					675.50
Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

Cost index 35.59 %	27.92
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	Total with Cost index				106.37
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3 Specification Code: 2.27

2.27

Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
Other Engineering Organisations TOTAL					14597.33
Add Water Charges @ 1%					145.97
TOTAL					14743.30
Add CPOH @ 15%					2211.49
TOTAL					16954.79
Cost of 10.0 cum					16954.79
Cost per cum					1695.48
Say					1695.5

	Cost index 35.59 %				603.43
	Total with Cost index				2298.93

4 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90

9999	Sundries-	L.S	13.52	2.00	27.04
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TOTAL					4578.85
Add Water Charges @ 1%					45.79
TOTAL					4624.64
Add CPOH @ 15%					693.70
TOTAL					5318.34
Cost of 1.0 cum					5318.34
Say					5318.35

Cost index 35.59 %					1892.80
Total with Cost index					7211.15

5 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50

0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Other Engineering Organisations	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65

Cost of 1.0 cum	6942.65
Say	6942.65

Cost index 35.59 %	2470.89
Total with Cost index	9413.54

6 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

7 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in position	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
TOTAL					6241.51
Add Water Charges @ 1%					62.42
TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52

Cost per kilogram	72.50
Say	72.5

Cost index	35.59 %				25.80
Total with Cost index					98.30

8 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	<p>Details of cost for 26.39 sqm</p> <p>Surface area</p> <p>Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm</p> <p>MATERIAL:</p> <p>Assuming that the timber will become unserviceable after being used 8 times</p> <p>planks 38 mm (Second class kail wood</p> <p>$26.39 \times 0.038 = 1.00$ cum</p> <p>Wastage 2% = 0.20 cum.</p> <p>Total = 1.20 cum . or 1200 cudm.</p> <p>Qty for cost using once = $1200/8 = 150$ cudm</p>				

1198	Second class kail wood in planks 2nd class kail wood battens Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712 \text{ cum}$ Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798 \text{ cum}$ Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = $0.1586/8 = 0.0198 \text{ cum}$	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside $25 \times 1.00 = 25.00 \text{ m}$ Outside $28 \times 1.00 = 28.00 \text{ m}$ Total = 53.00 m Qty for cost using once = $53/8 = 6.625 \text{ m}$ Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Cost index	35.59 %				65.54
Total with Cost index					249.69

9 Specification Code: 5.9.2

SUBHEAD 5.0

REINFORCED CEMENT CONCRETE

5.9

Centering and shuttering including strutting, etc. and removal of form for:

5.9.2

Walls (any thickness) including attached pilasters, buttresses, plinth and string courses etc.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 7.9m long and 1.00m high wall Area of contact $2 \times 7.9 \times 1.0 = 15.8$ sqm MATERIAL: Assuming shuttering material will become unserviceable after use of 40 times Adding for maintenance @ 10% of cost Taking salvage value after full use of material @ 25% of cost				
7319	wall form panel 1250x500 mm $2 \times 3 \times 2 \times 2 = 24$ Nos. Qty taken for cost of using once = $24 \times 0.85 / 40 = 0.51$	each	0.51	860.00	438.60
7327	100 mm channel shoulder 2.5 m long $4 \times 2 = 8$ Qty taken for cost of using once = $8 \times 0.85 / 40 = 0.17$	each	0.17	910.00	154.70
7328	Double clip (bridge clip) $2 \times 6 \times 2 = 24$ Qty taken for cost of using once = $24 \times 0.85 / 40 = 0.51$	each	0.51	76.00	38.76

7329	Single clip 2x3x2 = 12 Qty taken for cost of using once = 12x0.85/40 = 0.255	each	0.255	59.00	15.05
7330	M.S. Tube 40 mm dia 2x2x8m = 32m Qty taken for cost of using once = 32x0.85/40 = 0.68	metre	0.68	215.00	146.20
9999	Sundries-Qty taken for cost of using once = 1300x0.85/40 = 27.62	L.S	27.62	2.00	55.24
9977	Carriage LABOUR	L.S	78.0	2.00	156.00
0116	Fitter(grade1)	Day	3.5	738.00	2583.00
0114	Beldar	Day	6.0	558.00	3348.00
9999	Sundries- shuttering oil	L.S	78.0	2.00	156.00
9999	Sundries-	L.S	52.0	2.00	104.00
Other Engineering Organisations					7195.55
TOTAL					7195.55
Add Water Charges @ 1%					71.96
TOTAL					7267.51
Add CPOH @ 15%					1090.13
Costof 15.8 Sq. m.					8357.64
Cost per 1 Sq. m.					528.96
Say					528.95

	Cost index 35.59 %				188.25
	Total with Cost index				717.20

10 Specification Code: 5.9.16.1

5.9 Centering and shuttering including strutting, etc. and removal of form for:**5.9.16** Edges of slabs and breaks in floors and walls**5.9.16.1** Under 20 cm wide

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a 3mx3m slab 15cms thick 12m edge Length MATERIAL: Assuming that the timber will become unserviceable after being used 8 times				
1198	Second class kail wood in planks (i) Planks 30 mm thick (2nd class Kail wood or equivalent local soft wood) $4 \times 3 \times 0.15 \times 0.030 = 0.54 \text{ cum}$ Wastage @ 5% = 0.003 cum. Total = 0.057 cum 57 cudm Qty taken for cost of using once = $57/8 = 7.125 \text{ cudm}$	10 cud m	7.125	260.00	185.25
1197	Second class kail wood in scantling (ii) Battens 75 mm x 100 mm (2nd class Kail wood) Horizontal $2 \times 4 \times 0.075 \times 0.1 \times 0.5 = 0.030$ Horizontal $2 \times 4 \times 0.075 \times 0.1 \times 1.5 = 0.090$ (iii) Vertical battens $16 \times 0.15 \times 0.075 \times 0.030 \text{m} = 0.0054$ (iv) Struts $16 \times 0.25 \times 0.07 \times 0.075 = 0.0225$ Total = 0.1479 Wastage @ 5% = 0.0074 Total = 0.1553 cum = 155 cudm Qty taken for cost of using once = $155/8 = 19.375 \text{ cudm}$	10 cud m	19.375	260.00	503.75

2204	Carriage of Timber Planks = 0.057 cum. Batte4ns = 0.057 cum. Total = 0.212 cum. Qty taken for cost of using once = $0.212/8 = 0.0265$ cum LABOUR: For assembling erection dismantling & cleaning	cum	0.0265	118.59	3.14
0112	Carpenter 2nd class	Day	0.81	679.00	549.99
0114	Beldar	Day	0.54	558.00	301.32
9999	Sundries-	L.S	5.2	2.00	10.40

TOTAL					1553.85
Add Water Charges @ 1%					15.54
TOTAL					1569.39
Add CPOH @ 15%					235.41
Other Engineering Organisations TOTAL					1804.80
Cost of 12.0 metre					1804.80
Cost per metre					150.40
Say					150.4

Cost index	35.59 %				53.53
Total with Cost index					203.93

11 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
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	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40

	TOTAL	1641.80
	Add Water Charges @ 1%	16.42
	TOTAL	1658.22
	Add CPOH @ 15%	248.73
	TOTAL	1906.95
	Cost of 10.0 cum	1906.95
	Cost per cum	190.69
	Say	190.7

	Cost index 35.59 %	67.87
	Total with Cost index	258.57

12 Specification Code: 19.16

SUBHEAD : 19.0

DRAINAGE

19.16

Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded

stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foot rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number 4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) 1st class	Day	0.02	738.00	14.76
0124	Mason (brick layer) 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
Add Water Charges @ 1% except on A ie on (354.8-62.7=292.1)					2.92
TOTAL					357.72
Add CPOH @ 15% except on A ie on (357.72-62.7=295.02)					44.25
TOTAL					401.95
Cost of 1.0 each					401.95
Cost of 1 each					401.95
Say					401.95

	Cost index 35.59 %				143.05
	Total with Cost index				545.00

Pumpsets

1 Specification Code: od235677/2022_2023

od235677/2022_2023 :Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 15 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years

MR for Submercible pumpset -Av Rs. 18135 (based on KWA estimate approved rates)

Hence for 15HP pump= 15hp@Rs.18135=RS. 272025

Code	Description	Unit	Quantity	Rate	Amount
MR	15hp pumpset	each set	1.00000	272025.00	272025.00
TOTAL					272025.00
cost for one each set					272025.00
	say				272025.00

	Add Water Charges @ 1.0%				2720.25
	Add CPOH @ 15.0%				41211.78
	Cost index 35.59 %				0.00
	Total with Cost index				315957.04
	Say				315957.04

2 Specification Code: od247474/2022_2023

od247474/2022_2023 :Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 10 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years

MR for Submercible pumpset -Av Rs. 18135 (based on KWA estimate approved rates)

Hence for 10HP pump= 10hp@Rs.18135=RS. 181350

Code	Description	Unit	Quantity	Rate	Amount
MR	10 hp pumpset	each set	1.00000	181350.00	181350.00
TOTAL					181350.00
cost for one each set					181350.00
	say				181350.00

	Add Water Charges @ 1.0%				1813.50
	Add CPOH @ 15.0%				27474.52
	Cost index 35.59 %				0.00
	Total with Cost index				210638.03
	Say				210638.03

Construction of pump room

1 Specification Code: od248144/2022_2023

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od248144/2022_2023 :RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in verified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.

Code	Description	Unit	Quantity	Rate	Amount
MR	RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in verified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications. Plinth area Rates 2012 CPWD	sqm	1.00000	19000.00	19000.00
MR	Add 60% cost Index for 2012 items	sqm	0.60000	19000.00	11400.00
TOTAL					30400.00
cost for one sqm					30400.00
	say				30400.00

	Add Water Charges @ 1.0%				304.00
	Add CPOH @ 15.0%				4605.60
	Cost index 35.59 %				0.00
	Total with Cost index				35309.60
	Say				35309.60

Construction of RCC column & Erection of ISMB

1 Specification Code: 5.33.2

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2

All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00

0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level $0.75 \times 2.5 = 1.88$	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL					7026.36
Add Water Charges @ 1%					70.26
TOTAL					7096.62
Add CPOH @ 15%					1064.49
TOTAL					8161.11
Cost of 1.0 cum					8161.11
Say					8161.1

	Cost index 35.59 %				2904.54
	Total with Cost index				11065.64

2 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

3 Specification Code: od248149/2022_2023

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od248149/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
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MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60

TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

4 Specification Code: 5.9.6

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.6 Columns, Pillars, Piers, Abutments, Posts and Struts

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 4.5 sqm. Size of column 450x450mm and 2.5 m high Area of contact = $4 \times 0.45 \times 2.5 = 4.5$ sqm MATERIAL: Assuming shuttering will become unserviceable after use of 40 times Add maintenance charges @ 10 % of cost of material Less salvage value of material after full use @ 25% of cost of material				
7331	Wall form panel 1250x450xmm Qty taken for cost of using once = $8 \times 0.85 / 40 = 0.17$	each	0.17	860.00	146.20

7332	Corner angle 45x45x5 mm 2.50 long Qty taken for cost of using once = $4 \times 0.85 / 40 = 0.085$	each	0.085	255.00	21.68
7333	Column clamp 450x1070 mm Qty taken for cost of using once = $5 \times 0.85 / 40 = 0.1063$	each	0.1063	965.00	102.58
7334	Prop 2 m (2-3.5m) Qty taken for cost of using once = $4 \times 0.85 / 40 = 0.085$	each	0.085	635.00	53.98
9999	Sundries-Qty taken for cost of using once = $1300 \times 0.85 / 40 = 27.62$	L.S	27.62	2.00	55.24
9977	Carriage LABOUR	L.S	52.0	2.00	104.00
0116	Fitter(grade1)	Day	1.0	738.00	738.00
0114	Beldar	Day	2.0	558.00	1116.00
9999	Sundries-Shuttering oil	L.S	39.0	2.00	78.00
9999	Sundries-Carriage	L.S	26.0	2.00	52.00

TOTAL				2467.68
Add Water Charges @ 1%				24.68
TOTAL				2492.36
Add CPOH @ 15%				373.85
TOTAL				2866.21
Cost of 4.5 sqm				2866.21
Cost per sqm				636.94
Say				636.95

Cost index 35.59 %					226.69
Total with Cost index					863.64

5 Specification Code: 5.22.6

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6

Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in position	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
TOTAL					6241.51
Add Water Charges @ 1%					62.42
TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52
Cost per kilogram					72.50
Say					72.5

	Cost index	35.59 %			25.80
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	Total with Cost index				98.30
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6 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
TOTAL					1418.21
Add Water Charges @ 1%					14.18

TOTAL	1432.39
Add CPOH @ 15%	214.86
TOTAL	1647.25
Cost of 10.0 sqm	1647.25
Cost per sqm	164.72
Say	164.7

Cost index 35.59 %	58.62
Total with Cost index	223.32

7 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand)				
3.3	Rate as per item Number 3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43

0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL					2547.60
Add Water Charges @ 1%					25.48
TOTAL					2573.08
Add CPOH @ 15%					385.96
TOTAL					2959.04
Cost of 10.0 sqm					2959.04
Cost per sqm					295.90
Say					295.9

Cost index 35.59 %					105.31
Total with Cost index					401.21

Other Engineering Organisations

8 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:**13.39.2** New work (two or more coats) with a base coat of whitening

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80

9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46

TOTAL					287.76
Add Water Charges @ 1%					2.88
TOTAL					290.64
Add CPOH @ 15%					43.60
TOTAL					334.24
Cost of 10.0 sqm					334.24
Cost per sqm					33.42
Say					33.4

Cost index 35.59 %					11.89
Total with Cost index					45.29

Other Engineering Organisations

9 Specification Code: 10.2

SUBHEAD : 10.0**STEEL WORK****10.2**

Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
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	<p>Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL:</p> <p>(i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+</p> <p>Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg</p> <p>Total = 151.95 kg +</p> <p>Add wastage @ 5% = 7.60 kg</p> <p>Total = 159.55 kg. = 1.60 q</p>				
1007	<p>Structural steel such as tees, angles, channels and R.S. joists</p> <p>(ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+</p> <p>Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+</p> <p>Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg.</p> <p>Total = 50.65 kg+</p> <p>Add wastage @ 5% = 2.53kg</p> <p>Total = 53.18kg. = 0.53 qtl</p>	quintal	1.6	4600.00	7360.00

1009	<p>Flats exceeding 10 mm in thickness</p> <p>(iii) Gusset plates 10 mm thick: $1 \times 0.74 \times 0.35 \text{m} = 0.259 \text{ sqm.} +$ Shone $4 \times 0.46 \times 0.46 = 0.845 \text{ sqm.}$ Total = 1.104 sqm. $1.104 \text{ sqm @ } 78.4 \text{ kg/m} = 86.55 \text{ kg}$ 12 mm plates at the point of principal rafter and strut: $2 \times 0.3 \times 0.2 = 0.12 \text{ sqm.} +$ Tie beam, brace and strut: $2 \times 0.5 \times 0.3 = 0.30 \text{ sqm.} +$ Sole plates: $2 \times 0.46 \times 0.46 = 0.42 \text{ sqm.} +$ Anchor plate: $2 \times 0.46 \times 0.1 = 0.09 \text{ sqm.}$ Total = 0.93 sqm. Say 1.00 sqm. $1.00 \text{ sqm. @ } 94.4 \text{ kg/m} = 94.40 \text{ kg.}$ Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00 kg or 1.90 q</p>	quintal	0.53	4600.00	2438.00
1010	<p>Mild steel plates</p> <p>(iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.</p>	quintal	1.9	4800.00	9120.00
1020	<p>Mild steel rivets</p> <p>(v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm</p>	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	<p>Carriage of Steel</p> <p>Carriage of steel $(0.160 + 0.053 + 0.091 + 0.099 + 0.007 + 0.005) =$ 0.415 tonne LABOUR:</p>	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40

0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron $9.5 \times 0.4 = 3.80$ sqm. + Struts $2.70 \times 0.16 = 0.43$ sqm. + Ties $5.4 \times 0.124 = 0.67$ sqm. + Braces $2 \times 1.84 \times 0.12 = 0.44$ sqm. + Ties $2.8 \times 0.12 = 0.34$ sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number 13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

Add Water Charges @ 1% except on A ie on (30081.43-249.92=29831.51)				298.32
TOTAL				30379.75
Add CPOH @ 15% except on A ie on (30379.75-249.92=30129.83)				4519.47
TOTAL				34898.25
Cost of 395.0 kg				34898.25
Cost of 1 kg				88.35
Say				88.35

	Cost index 35.59 %				31.44
	Total with Cost index				119.79

10 Specification Code: od248166/2022_2023

od248166/2022_2023 :Charges for chain pulley block with travelling trolley of 1 Tonne capacity

Code	Description	Unit	Quantity	Rate	Amount
MR	Pulley Block - 1 Tonne	each	1.00000	10868.00	10868.00
MR	Extra length	metre	4.00000	473.00	1892.00
TOTAL					12760.00
	cost for 1.1615 each				12760.00
	cost for one each				10985.79
	say				10985.79

	Add Water Charges @ 1.0%				109.85
	Add CPOH @ 15.0%				1664.34
	Cost index 35.59 %				0.00
	Total with Cost index				12760.00
	Other Engineering Say Organisations				12760.00

PRICE

**Sewerage Scheme- Construction of wet well 2 (Kathrikkadavu well) (Block 12B) ,
Grit /Screen Chamber and connected works at Elamkulam STP**

General Abstract

(Dsor year: **2018**, Cost Index Applied for this estimate is **35.59%**)

SI No	Heading Description	Amount
1	Colletion well 6m dia	3505460.73
2	Grit/Screen Chamber 3m dia	1496174.34
3	Silt Pit 1.5mx1.5mx1.2m	83922.07
4	Valve chamber 2.3mx3.8mx1.9m	261536.37
5	Pumpsets	2948932.36
6	Construction of pump room	1017340.19
7	Generator pedestal & mounting structure with roof sheet.	100000.00
8	Construction of Column & Erection of ISMB	97076.62
9	Providing Advanced odor control mechanism including cost of all (OCU capacity-WW2: 1,650 m3 /hr including installation	1610000.00
Provision for GST payments (in %) @		0.0%
Amount reserved for GST payments		0.00
Total		11120443.00
Lumpsum for round off		557.00
		TOTAL Rs 11121000.00
		Rounded Total Rs 1,11,21,000
		Rupees One Crore Eleven Lakh Twenty One Thousand Only

(Cost Index Applied for this estimate is 35.59%)

Sewerage Scheme- Construction of wet well 2 (Kathrikkadavu well) (Block 12B) , Grit /Screen Chamber and connected works at Elamkulam STP

Abstract Estimate

(Dsor year: **2018**, Cost Index Applied for this estimate is **35.59%**)

1 Colletion well 6m dia		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed. All kinds of soil	
Net Total Quantity		100.480 cum
Say 100.480 cum @ Rs 214.03 / cum		Rs 21505.73
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. All kinds of soil	
Net Total Quantity		25.120 cum
Say 25.120 cum @ Rs 106.37 / cum		Rs 2672.01
3	od226268/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (6m diameter)	
Net Total Quantity		1.000 metre
Say 1.000 metre @ Rs 34446.20 / metre		Rs 34446.20
4	od226271/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (6m diameter)	
Net Total Quantity		1.500 metre
Say 1.500 metre @ Rs 36358.09 / metre		Rs 54537.13
5	od226273/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (6m diameter)	
Net Total Quantity		1.500 metre
Say 1.500 metre @ Rs 38272.80 / metre		Rs 57409.20

6	od226275/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (6m diameter)	
Net Total Quantity		1.360 metre
Say 1.360 metre @ Rs 40184.68 / metre		Rs 54651.16
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		382.468 sqm
Say 382.468 sqm @ Rs 249.69 / sqm		Rs 95498.43
8	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		100.539 cum
Say 100.539 cum @ Rs 9413.54 / cum		Rs 946427.90
9	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
Net Total Quantity		12.435 cum
Say 12.435 cum @ Rs 11065.64 / cum		Rs 137601.23
10	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		112.974 cum
Say 112.974 cum @ Rs 82.10 / cum		Rs 9275.17
11	od226277/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	

Net Total Quantity		112.974 cum
Say 112.974 cum @ Rs 1916.05 / cum		Rs 216463.83
12	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
Net Total Quantity		7.065 cum
Say 7.065 cum @ Rs 7990.86 / cum		Rs 56455.43
13	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		382.076 kilogram
Say 382.076 kilogram @ Rs 101.29 / kilogram		Rs 38700.48
14	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		13.678 cum
Say 13.678 cum @ Rs 7211.15 / cum		Rs 98634.11
15	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		13963.702 kilogram
Say 13963.702 kilogram @ Rs 98.30 / kilogram		Rs 1372631.91
16	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
Net Total Quantity		698.186 sqm
Say 698.186 sqm @ Rs 223.32 / sqm		Rs 155918.90
17	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		19.092 cum
Say 19.092 cum @ Rs 258.57 / cum		Rs 4936.62

18	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
Net Total Quantity		25.000 each
Say 25.000 each @ Rs 545.00 / each		Rs 13625.00
19	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whitening	
Net Total Quantity		35.043 sqm
Say 35.043 sqm @ Rs 45.29 / sqm		Rs 1587.10
20	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		1105.962 kg
Say 1105.962 kg @ Rs 119.79 / kg		Rs 132483.19
Other Engineering Organisations 2 Grit/Screen Chamber 3m dia		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		40.836 cum
Say 40.836 cum @ Rs 214.03 / cum		Rs 8740.13
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		10.209 cum
Say 10.209 cum @ Rs 106.37 / cum		Rs 1085.93
3	od226267/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m	

Net Total Quantity		1.000 metre
Say 1.000 metre @ Rs 10859.75 / metre		Rs 10859.75
4	od226270/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m	
Net Total Quantity		1.500 metre
Say 1.500 metre @ Rs 11469.39 / metre		Rs 17204.09
5	od226274/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m	
Net Total Quantity		0.500 metre
Say 0.500 metre @ Rs 12078.90 / metre		Rs 6039.45
6	od235344/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)	
Net Total Quantity		0.300 metre
Say 0.300 metre @ Rs 16674.35 / metre		Rs 5002.30
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		168.313 sqm
Say 168.313 sqm @ Rs 249.69 / sqm		Rs 42026.07
8	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		33.892 cum
Say 33.892 cum @ Rs 9413.54 / cum		Rs 319043.70

9	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
Net Total Quantity		4.875 cum
Say 4.875 cum @ Rs 11065.64 / cum		Rs 53944.99
10	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		38.767 cum
Say 38.767 cum @ Rs 82.10 / cum		Rs 3182.77
11	od226277/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		38.767 cum
Say 38.767 cum @ Rs 1916.05 / cum		Rs 74279.51
12	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
Net Total Quantity		1.767 cum
Say 1.767 cum @ Rs 7990.86 / cum		Rs 14119.85
13	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		206.958 kilogram
Say 206.958 kilogram @ Rs 101.29 / kilogram		Rs 20962.78
14	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		2.120 cum
Say 2.120 cum @ Rs 7211.15 / cum		Rs 15287.64

15	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric	
Net Total Quantity		4768.028 kilogram
Say 4768.028 kilogram @ Rs 108.47 / kilogram		Rs 517188.00
16	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		26.706 cum
Say 26.706 cum @ Rs 258.57 / cum		Rs 6905.37
17	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
Net Total Quantity		21.000 each
Say 21.000 each @ Rs 545.00 / each		Rs 11445.00
18	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whitening	
Net Total Quantity		17.121 sqm
Say 17.121 sqm @ Rs 45.29 / sqm		Rs 775.41
19	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		1000.339 kg
Say 1000.339 kg @ Rs 119.79 / kg		Rs 119830.61
20	od247983/2022_2023 Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangment and hand wheel fitted in well. 	
Net Total Quantity		1.000 each
Say 1.000 each @ Rs 248251.00 / each		Rs 248251.00
3 Silt Pit 1.5mx1.5mx1.2m		

1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		12.936 cum
Say 12.936 cum @ Rs 214.03 / cum		Rs 2768.69
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		1.176 cum
Say 1.176 cum @ Rs 106.37 / cum		Rs 125.09
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
Net Total Quantity		1.176 cum
Say 1.176 cum @ Rs 2298.93 / cum		Rs 2703.54
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		0.485 cum
Say 0.485 cum @ Rs 7211.15 / cum		Rs 3497.41
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		3.043 cum
Say 3.043 cum @ Rs 9413.54 / cum		Rs 28645.40
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		3.043 cum
Say 3.043 cum @ Rs 82.10 / cum		Rs 249.83

7	od226277/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		3.043 cum
Say 3.043 cum @ Rs 1916.05 / cum		Rs 5830.54
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		304.300 kilogram
Say 304.300 kilogram @ Rs 98.30 / kilogram		Rs 29912.69
9	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
Net Total Quantity		15.459 sqm
Say 15.459 sqm @ Rs 223.32 / sqm		Rs 3452.30
10	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		21.250 sqm
Say 21.250 sqm @ Rs 249.69 / sqm		Rs 5305.91
11	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		5.533 cum
Say 5.533 cum @ Rs 258.57 / cum		Rs 1430.67
4 Valve chamber 2.3mx3.8mx1.9m		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		45.215 cum
Say 45.215 cum @ Rs 214.03 / cum		Rs 9677.37
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		16.355 cum

Say 16.355 cum @ Rs 106.37 / cum		Rs 1739.68
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
Net Total Quantity		2.886 cum
Say 2.886 cum @ Rs 2298.93 / cum		Rs 6634.71
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		1.584 cum
Say 1.584 cum @ Rs 7211.15 / cum		Rs 11422.46
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		9.961 cum
Say 9.961 cum @ Rs 9413.54 / cum		Rs 93768.27
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		9.961 cum
Say 9.961 cum @ Rs 82.10 / cum		Rs 817.80
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		996.100 kilogram
Say 996.100 kilogram @ Rs 98.30 / kilogram		Rs 97916.63
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		52.481 sqm
Say 52.481 sqm @ Rs 249.69 / sqm		Rs 13103.98

9	5.9.2 Centering and shuttering including strutting, etc. and removal of form for:Walls (any thickness) including attached pilasters, butteresses, plinth and string courses etc.	
Net Total Quantity		23.180 sqm
Say 23.180 sqm @ Rs 717.20 / sqm		Rs 16624.70
10	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide	
Net Total Quantity		14.200 metre
Say 14.200 metre @ Rs 203.93 / metre		Rs 2895.81
11	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		14.174 cum
Say 14.174 cum @ Rs 258.57 / cum		Rs 3664.97
12	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
Net Total Quantity		6.000 each
Say 6.000 each @ Rs 545.00 / each		Rs 3270.00
5 Pumpsets		
1	od235678/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 20 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years	
Net Total Quantity		2.000 each set
Say 2.000 each set @ Rs 421276.05 / each set		Rs 842552.10

2	od235682/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 50 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years	
Net Total Quantity		2.000 each set
Say 2.000 each set @ Rs 1053190.13 / each set		Rs 2106380.26
6 Construction of pump room		
1	od248169/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in verified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.	
Net Total Quantity		28.812 sqm
Say 28.812 sqm @ Rs 35309.60 / sqm		Rs 1017340.20
7 Generator pedestal & mounting structure with roof sheet.		
Lump-Sum Total		Rs 100000.00
8 Construction of Column & Erection of ISMB		
1	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
Net Total Quantity		0.540 cum
Say 0.540 cum @ Rs 11065.64 / cum		Rs 5975.45
2	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	

Net Total Quantity		0.540 cum
Say 0.540 cum @ Rs 82.10 / cum		Rs 44.33
3	od248928/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		0.540 cum
Say 0.540 cum @ Rs 1916.05 / cum		Rs 1034.67
4	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts	
Net Total Quantity		7.200 sqm
Say 7.200 sqm @ Rs 863.64 / sqm		Rs 6218.21
5	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		54.000 kilogram
Say 54.000 kilogram @ Rs 98.30 / kilogram		Rs 5308.20
6	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
Net Total Quantity		10.088 sqm
Say 10.088 sqm @ Rs 223.32 / sqm		Rs 2252.85
7	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
Net Total Quantity		7.380 sqm
Say 7.380 sqm @ Rs 401.21 / sqm		Rs 2960.93
8	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
Net Total Quantity		7.380 sqm
Say 7.380 sqm @ Rs 45.29 / sqm		Rs 334.24
9	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		453.600 kg
Say 453.600 kg @ Rs 119.79 / kg		Rs 54336.74

10	od249251/2022_2023 Charges for chain pulley block with travelling trolley of 2 Tonne capacity	
Net Total Quantity		1.000 each
Say 1.000 each @ Rs 18611.00 / each		Rs 18611.00
9 Providing Advanced odor control mechanism including cost of all (OCU capacity-WW2: 1,650 m3 /hr including installation		
Lump-Sum Total		Rs 1610000.00
	Provision for GST payments (in %) @	0.0%
Amount reserved for GST payments		0.00
Total		11120443.00
Lumpsum for round off		557.00
TOTAL Rs 11121000.00		
Rounded Total Rs 1,11,21,000		
Rupees One Crore Eleven Lakh Twenty One Thousand Only		

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations

PRICE

**Sewerage Scheme- Construction of wet well 2 (Kathrikkadavu well) (Block 12B) ,
Grit /Screen Chamber and connected works at Elamkulam STP**

Detailed Estimate

(Dsor year: **2018**, Cost Index Applied for this estimate is **35.59%**)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
1 Colletion well 6m dia								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed. All kinds of soil							
	First depth 0 to 1.5m	3.14/4	8.000	8.000	1.500		75.360	
	Second depth 1.5m to 2m	3.14/4	8.000	8.000	0.500		25.120	
	Total Quantity						100.480 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						100.480 cum	
	Say 100.480 cum @ Rs 214.03 / cum						Rs 21505.73	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. All kinds of soil							
	For Earth work 1.5m to 2m	1*3.14/4	8.000	8.000	0.500		25.120	
	Total Quantity						25.120 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						25.120 cum	
	Say 25.120 cum @ Rs 106.37 / cum						Rs 2672.01	
3	od226268/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (6m diameter)							
		1	1.000				1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 34446.20 / metre						Rs 34446.20	

4	od226271/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (6m diameter)							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 36358.09 / metre						Rs 54537.13	
5	od226273/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (6m diameter)							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 38272.80 / metre						Rs 57409.20	
6	od226275/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (6m diameter)							
		1			1.360		1.360	
	Total Quantity						1.360 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.360 metre	
	Say 1.360 metre @ Rs 40184.68 / metre						Rs 54651.16	
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Upto 1m above and 3m below GL -well Kerb - inner	1*3.14	6.000	0.600			11.304	
	well Kerb - outer	1*3.14	7.350	1.330			30.696	
	well Kerb - Slope	3.14	6+6.53		0.900		35.410	

	Side wall	2*3.14	6.600		7.360		305.058	
	Total Quantity						382.468 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						382.468 sqm	
	Say 382.468 sqm @ Rs 249.69 / sqm						Rs 95498.43	
8	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	6.000	6.000	0.600		16.956	
	From 1.5m to 4.5m below ground level-kerb	4.50					4.500	$((0.675*0.6)+(0.15*0.725)+(0.5*(0.675-0.15)*0.725))*21$
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	0.600	6.600	6.360		79.083	
	Total Quantity						100.539 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						100.539 cum	
	Say 100.539 cum @ Rs 9413.54 / cum						Rs 946427.90	
9	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	3.14	6.600	0.600	1.000		12.435	
	Total Quantity						12.435 cum	

	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						12.435 cum	
	Say 12.435 cum @ Rs 11065.64 / cum						Rs 137601.23	
10	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	6.000	6.000	0.600		16.956	
	From 1.5m to 4.5m below ground level-kerb	4.50					4.500	$((0.675 \times 0.6) + (0.15 \times 0.725) + (0.5 \times (0.675 - 0.15) \times 0.725)) \times 21$
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	6.600	0.600	6.360		79.083	
	Side wall	3.14	6.600	0.600	1.000		12.435	
	Total Quantity						112.974 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						112.974 cum	
	Say 112.974 cum @ Rs 82.10 / cum						Rs 9275.17	
11	od226277/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	6.000	6.000	0.600		16.956	
	From 1.5m to 4.5m below ground level-kerb	4.5					4.500	$((0.675 \times 0.6) + (0.15 \times 0.725) + (0.5 \times (0.675 - 0.15) \times 0.725)) \times 21$
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	6.600	0.600	6.360		79.083	
	Side wall	3.14	6.600	0.600	1.000		12.435	

	Total Quantity						112.974 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						112.974 cum	
	Say 112.974 cum @ Rs 1916.05 / cum						Rs 216463.83	
12	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	Benching	3.14/4	6.000	6.000	0.250		7.065	
	Total Quantity						7.065 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						7.065 cum	
	Say 7.065 cum @ Rs 7990.86 / cum						Rs 56455.43	
13	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	7.200	16.900			382.076	
	Total Quantity						382.076 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						382.076 kilogram	
	Say 382.076 kilogram @ Rs 101.29 / kilogram						Rs 38700.48	
14	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging bottom	3.14/4	6.600	6.600	0.400		13.678	
	Total Quantity						13.678 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						13.678 cum	
	Say 13.678 cum @ Rs 7211.15 / cum						Rs 98634.11	
15	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							

	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	6.000	6.000	0.600	120.0	2034.720	
	From 1.5m to 4.5m below ground level-kerb	4.5				120.0	540.000	$((0.675 \times 0.6) + (0.15 \times 0.725) + (0.5 \times (0.675 - 0.15) \times 0.725)) \times 21$
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	6.600	0.600	6.360	120.0	9489.935	
	Side wall	3.14	6.600	0.600	1.000	120.0	1492.128	
	Wastage 2.5%	13563.94				0.03	406.919	
	Total Quantity						13963.702 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						13963.702 kilogram	
	Say 13963.702 kilogram @ Rs 98.30 / kilogram						Rs 1372631.91	
16	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On steel work							
		13963.702				0.05	698.186	0.0508 m ² /kg
	Total Quantity						698.186 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						698.186 sqm	
	Say 698.186 sqm @ Rs 223.32 / sqm						Rs 155918.90	
17	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total volume of the well	1*3.14/4	7.200	7.200	2.000		-81.388	
	First depth 0 to 1.5m	3.14/4	8.000	8.000	1.500		75.360	
	Second depth 1.5m to 2m	3.14/4	8.000	8.000	0.500		25.120	
	Total Quantity						100.480 cum	

	Total Deducted Quantity						-81.388 cum
	Net Total Quantity						19.092 cum
	Say 19.092 cum @ Rs 258.57 / cum						Rs 4936.62
18	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design						
		25					25.000
	Total Quantity						25.000 each
	Total Deducted Quantity						0.000 each
	Net Total Quantity						25.000 each
	Say 25.000 each @ Rs 545.00 / each						Rs 13625.00
19	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting						
	Well outer	1*3.14	7.200	1.000			22.608
	top of wall thickness	1*3.14	6.600	0.600			12.435
	Total Quantity						35.043 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						35.043 sqm
	Say 35.043 sqm @ Rs 45.29 / sqm						Rs 1587.10
20	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.						
	Area of pumping station (40.694sqm)						

	(33*0.59)+(17*0.28)=24.23 kg/m	1	40.694			24.23	986.016	25 x 3 flats at 30 mm spacing=3 3nos@0.59, 12 x 3 flats at 60 mm spacing=17@.28
	25 x6 SS for outer frame@1.18kg/m	1*3.14	7.200			1.18	26.678	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	7.200			3.92	56.448	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	6.000			4.47	26.820	
	Misc. items for opening frame	1	10.000				10.000	
	Total Quantity						1105.962 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						1105.962 kg	
	Say 1105.962 kg @ Rs 119.79 / kg						Rs 132483.19	
SI No	Description	No	L	B	D	CF	Quantity	Remark
2 Grit/Screen Chamber 3m dia								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	For 0 to 1.5 m	1*3.14/4	5.100	5.100	1.500		30.627	
	For 1.5m to 2 m	1*3.14/4	5.100	5.100	0.500		10.209	
	Total Quantity						40.836 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						40.836 cum	
	Say 40.836 cum @ Rs 214.03 / cum						Rs 8740.13	
2	2.26.1							

	Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
	For 1.5m to 2m	1*3.14/4	5.100	5.100	0.500		10.209	
	Total Quantity						10.209 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						10.209 cum	
	Say 10.209 cum @ Rs 106.37 / cum						Rs 1085.93	
3	od226267/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m							
		1	1.000				1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 10859.75 / metre						Rs 10859.75	
4	od226270/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 11469.39 / metre						Rs 17204.09	
5	od226274/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m							
		1	0.500				0.500	
	Total Quantity						0.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.500 metre	
	Say 0.500 metre @ Rs 12078.90 / metre						Rs 6039.45	

6	od235344/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)							
		1			0.300		0.300	
	Total Quantity						0.300 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.300 metre	
	Say 0.300 metre @ Rs 16674.35 / metre						Rs 5002.30	
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Well kerb inner	1*3.14	3.000	0.450			4.240	
	Well kerb outer	1*3.14	4.050	1.050			13.353	
	Well kerb Slope	1*3.14	3.000+3.3 8		0.710		14.224	
	Side wall	2*3.14	3.450	6.300			136.496	
	Total Quantity						168.313 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						168.313 sqm	
	Say 168.313 sqm @ Rs 249.69 / sqm						Rs 42026.07	
8	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	
	Well kerb	1	11.070	0.525	0.450		2.616	Circum=3.14*3.53=11.07
		1	11.070	0.150	0.600		0.997	Circum=3.14*3.53=11.07

		1*.5	11.070	0.380	0.600		1.262	Circum=3. 14*3.53=1 1.07
	Side Wall	3.14	3.450	0.450	5.300		25.837	Circum=3. 14*3.53=1 1.07
	Total Quantity						33.892 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						33.892 cum	
	Say 33.892 cum @ Rs 9413.54 / cum						Rs 319043.70	
9	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	1*3.14	3.450	0.450	1.000		4.875	
	Total Quantity						4.875 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						4.875 cum	
	Say 4.875 cum @ Rs 11065.64 / cum						Rs 53944.99	
10	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	
	Well kerb	1	11.070	0.525	0.450		2.616	Circum=3. 14*3.53=1 1.07
		1	11.070	0.150	0.600		0.997	Circum=3. 14*3.53=1 1.07
		1*.5	11.070	0.380	0.600		1.262	Circum=3. 14*3.53=1 1.07

	Side Wall	3.14	3.450	0.450	5.300		25.837	Circum=3.14*3.53=11.07
	Side wall	1*3.14	3.450	0.450	1.000		4.875	
	Total Quantity						38.767 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						38.767 cum	
	Say 38.767 cum @ Rs 82.10 / cum						Rs 3182.77	
11	od226277/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	
	Well kerb	1	11.070	0.525	0.450		2.616	Circum=3.14*3.53=11.07
		1	11.070	0.150	0.600		0.997	Circum=3.14*3.53=11.07
		1*5	11.070	0.380	0.600		1.262	Circum=3.14*3.53=11.07
	Side Wall	3.14	3.450	0.450	5.300		25.837	Circum=3.14*3.53=11.07
	Side wall	1*3.14	3.450	0.450	1.000		4.875	
	Total Quantity						38.767 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						38.767 cum	
	Say 38.767 cum @ Rs 1916.05 / cum						Rs 74279.51	
12	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	Benching	1*3.14/4	3.000	3.000	0.250		1.767	
	Total Quantity						1.767 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.767 cum	
	Say 1.767 cum @ Rs 7990.86 / cum						Rs 14119.85	

13	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	3.900	16.900			206.958	
	Total Quantity						206.958 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						206.958 kilogram	
	Say 206.958 kilogram @ Rs 101.29 / kilogram						Rs 20962.78	
14	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging the bottom of the well	1*3.14/4	3.000	3.000	0.300		2.120	
	Total Quantity						2.120 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.120 cum	
	Say 2.120 cum @ Rs 7211.15 / cum						Rs 15287.64	
15	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric							
	B o t t o m slab@120kg/m3 of concrete	1*3.14	1.500	1.500	0.450	120.0	381.510	
	Well kerb@120kg/m3 of concrete	1	11.070	0.525	0.450	120.0	313.835	Circum=3.14*3.53=11.07
	@ 120 kg / m 3 of concrete	1	11.070	0.150	0.600	120.0	119.556	Circum=3.14*3.53=11.07
	@ 120 kg / m 3 of concrete	1*5	11.070	0.380	0.600	120.0	151.438	Circum=3.14*3.53=11.07
	Side Wall@120kg/m3 of concrete	3.14	3.450	0.450	5.300	120.0	3100.405	Circum=3.14*3.53=11.07

	Side wall@120kg/m ³ of concrete	1*3.14	3.450	0.450	1.000	120.0	584.983	
	wastage at 2.5%	4652.01			2.5/100		116.301	
	Total Quantity						4768.028 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						4768.028 kilogram	
	Say 4768.028 kilogram @ Rs 108.47 / kilogram						Rs 517188.00	
16	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Earthwork Qty as per item 1	1	40.836				40.836	
	Volume of well	1*3.14/4	3.000	3.000	2.000		-14.130	
	Total Quantity						40.836 cum	
	Total Deducted Quantity						-14.130 cum	
	Net Total Quantity						26.706 cum	
	Say 26.706 cum @ Rs 258.57 / cum						Rs 6905.37	
17	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		21					21.000	
	Total Quantity						21.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						21.000 each	
	Say 21.000 each @ Rs 545.00 / each						Rs 11445.00	
18	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	Well outer	1	3.140	3.900	1.000		12.246	
	Wall top	1	3.140	3.450	0.450		4.875	

	Total Quantity							17.121 sqm
	Total Deducted Quantity							0.000 sqm
	Net Total Quantity							17.121 sqm
	Say 17.121 sqm @ Rs 45.29 / sqm							Rs 775.41
19	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Area of slant screen(3*1.8)=5.4sqm							
	weight of 29 nos 50mmx10mm flats at 3 5 m m spacing@3.92k/m	29	5.400			3.92	613.873	
	50 x 10mm SS for o u t e r frame @3.92Kg/m	1	(3+1.8)*2			3.92	37.632	
	Area of pumping station 12sqm							
	25 x 3 flats at 30 mm spacing@.58kg/m	33	12.000			0.59	233.640	
	12 x 3 flats at 60 mm spacing	17	12.000			0.28	57.121	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.900			3.92	30.576	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	1.800			4.47	8.046	
	Misc. items for opening frame	1	5.000				5.000	
	25 x6 SS for outer frame	3.14	3.900			1.18	14.451	@1.18kg/ m
	Total Quantity							1000.339 kg
	Total Deducted Quantity							0.000 kg
	Net Total Quantity							1000.339 kg
	Say 1000.339 kg @ Rs 119.79 / kg							Rs 119830.61
20	od247983/2022_2023 Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating,							

	spindle made of Stainless steel, CI head stock with gear arrangment and hand wheel fitted in well. 							
		1					1.000	
	Total Quantity						1.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						1.000 each	
	Say 1.000 each @ Rs 248251.00 / each						Rs 248251.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
3 Silt Pit 1.5mx1.5mx1.2m								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	2.800	2.800	1.650		12.936	
	Total Quantity						12.936 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						12.936 cum	
	Say 12.936 cum @ Rs 214.03 / cum						Rs 2768.69	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
		1	2.800	2.800	0.150		1.176	
	Total Quantity						1.176 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.176 cum	
	Say 1.176 cum @ Rs 106.37 / cum						Rs 125.09	
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	2.800	2.800	0.150		1.176	
	Total Quantity						1.176 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.176 cum	
	Say 1.176 cum @ Rs 2298.93 / cum						Rs 2703.54	
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and							

	shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	2.200	2.200	0.100		0.485	
	Total Quantity						0.485 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.485 cum	
	Say 0.485 cum @ Rs 7211.15 / cum						Rs 3497.41	
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 9413.54 / cum						Rs 28645.40	
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 82.10 / cum						Rs 249.83	
7	od226277/2022_2023							

	Extra for providing sulphate resistant cement for the structures above plinth level.							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 1916.05 / cum						Rs 5830.54	
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	100Kg/m3 of concrete	1	3.043	100.000			304.300	
	Total Quantity						304.300 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						304.300 kilogram	
	Say 304.300 kilogram @ Rs 98.30 / kilogram						Rs 29912.69	
9	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
	@0.0508sqm/kg	304.300				0.05	15.459	
	Total Quantity						15.459 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						15.459 sqm	
	Say 15.459 sqm @ Rs 223.32 / sqm						Rs 3452.30	
10	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Base slab side	4	2.000		0.200		1.600	
	Inner side	4	1.500		1.200		7.200	
	Outer side	4	2.000		1.200		9.600	
	Baffle wall	2	1.500		0.950		2.850	
	Total Quantity						21.250 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						21.250 sqm	

	Say 21.250 sqm @ Rs 249.69 / sqm						Rs 5305.91	
11	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total Excavation Item 1	1	12.936				12.936	
	Sand filling item 2	1	1.176				-1.176	
	PCC item3	1	0.485				-0.485	
	RCC item5	1	3.043				-3.043	
	Pit size	1	1.500	1.500	1.200		-2.699	
	Total Quantity						12.936 cum	
	Total Deducted Quantity						-7.403 cum	
	Net Total Quantity						5.533 cum	
	Say 5.533 cum @ Rs 258.57 / cum						Rs 1430.67	
SI No	Description	No	L	B	D	CF	Quantity	Remark
4 Valve chamber 2.3mx3.8mx1.9m								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	3.700	5.200	2.350		45.215	
	Total Quantity						45.215 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						45.215 cum	
	Say 45.215 cum @ Rs 214.03 / cum						Rs 9677.37	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
		1	3.700	5.200	0.850		16.355	
	Total Quantity						16.355 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						16.355 cum	
	Say 16.355 cum @ Rs 106.37 / cum						Rs 1739.68	
3	2.27							

	Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	3.700	5.200	0.150		2.886	
	Total Quantity						2.886 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.886 cum	
	Say 2.886 cum @ Rs 2298.93 / cum						Rs 6634.71	
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	3.300	4.800	0.100		1.584	
	Total Quantity						1.584 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.584 cum	
	Say 1.584 cum @ Rs 7211.15 / cum						Rs 11422.46	
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Raft	1	3.100	4.600	0.200		2.853	
	Walls	2	2.700	0.200	1.900		2.052	
		2	3.800	0.200	1.900		2.888	
	Slab	1	2.800	4.300	0.180		2.168	
	Total Quantity						9.961 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						9.961 cum	
	Say 9.961 cum @ Rs 9413.54 / cum						Rs 93768.27	
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Raft	1	3.100	4.600	0.200		2.853	

	Walls	2	2.700	0.200	1.900		2.052	
		2	3.800	0.200	1.900		2.888	
	Slab	1	2.800	4.300	0.180		2.168	
	Total Quantity						9.961 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						9.961 cum	
	Say 9.961 cum @ Rs 82.10 / cum						Rs 817.80	
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more							
	@ 100kg per m3 concrete	1	9.961	100.000			996.100	
	Total Quantity						996.100 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						996.100 kilogram	
	Say 996.100 kilogram @ Rs 98.30 / kilogram						Rs 97916.63	
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for: Well steining							
	Raft	2	3.100		0.200		1.241	
		2		4.600	0.200		1.840	
	Walls outer	2	2.700		1.900		10.260	
		2		4.200	1.900		15.960	
	Walls inner	2	2.300		1.900		8.740	
		2		3.800	1.900		14.440	
	Total Quantity						52.481 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						52.481 sqm	
	Say 52.481 sqm @ Rs 249.69 / sqm						Rs 13103.98	
9	5.9.2 Centering and shuttering including strutting, etc. and removal of form for: Walls (any thickness) including attached pilasters, buttresses, plinth and string courses etc.							
	Cover slab	2	2.300		1.900		8.740	
		2		3.800	1.900		14.440	
	Total Quantity						23.180 sqm	
	Total Deducted Quantity						0.000 sqm	

	Net Total Quantity						23.180 sqm	
	Say 23.180 sqm @ Rs 717.20 / sqm						Rs 16624.70	
10	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide							
	Cover slab	2	2.800+4.3				14.200	
	Total Quantity						14.200 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						14.200 metre	
	Say 14.200 metre @ Rs 203.93 / metre						Rs 2895.81	
11	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total excavated earth Item 1	1	45.210				45.210	
	Sand filling Item 2	1	2.890				-2.890	
	PCC item 3	1	1.580				-1.580	
	RCC item 4	1	9.961				-9.961	
	Chamber size	1	2.300	3.800	1.900		-16.605	
	Total Quantity						45.210 cum	
	Total Deducted Quantity						-31.036 cum	
	Net Total Quantity						14.174 cum	
	Say 14.174 cum @ Rs 258.57 / cum						Rs 3664.97	
12	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		6					6.000	
	Total Quantity						6.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						6.000 each	

Say 6.000 each @ Rs 545.00 / each							Rs 3270.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
5 Pumpsets								
1	od235678/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 20 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years							
		2					2.000	
	Total Quantity						2.000 each set	
	Total Deducted Quantity						0.000 each set	
	Net Total Quantity						2.000 each set	
	Say 2.000 each set @ Rs 421276.05 / each set						Rs 842552.10	
2	od235682/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 50 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years							
		2					2.000	
	Total Quantity						2.000 each set	
	Total Deducted Quantity						0.000 each set	
	Net Total Quantity						2.000 each set	
	Say 2.000 each set @ Rs 1053190.13 / each set						Rs 2106380.26	
SI No	Description	No	L	B	D	CF	Quantity	Remark
6 Construction of pump room								

1	od248169/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in verified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.							
		1	6.460	4.460			28.812	
	Total Quantity						28.812 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						28.812 sqm	
	Say 28.812 sqm @ Rs 35309.60 / sqm						Rs 1017340.20	
SI No	Description	No	L	B	D	CF	Quantity	Remark
7 Generator pedestal & mounting structure with roof sheet.								
Lump-Sum Total						Rs 100000.00		
	SI No	Description	No	L	B	D	CF	Quantity
Remark	8 Construction of Column & Erection of ISMB							
1	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	upto 1.5 m from G.L	2	0.300	0.300	0.500		0.090	
	1.5m to 4.5m above G.L	2	0.300	0.300	2.500		0.450	
	Total Quantity						0.540 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.540 cum	
	Say 0.540 cum @ Rs 11065.64 / cum						Rs 5975.45	
2	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	upto 1.5 m from G.L	2	0.300	0.300	0.500		0.090	

	1.5m to 4.5m above G.L	2	0.300	0.300	2.500		0.450	
	Total Quantity						0.540 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.540 cum	
	Say 0.540 cum @ Rs 82.10 / cum						Rs 44.33	
3	od248928/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	upto 1.5 m from G.L	2	0.300	0.300	0.500		0.090	
	1.5m to 4.5m above G.L	2	0.300	0.300	2.500		0.450	
	Total Quantity						0.540 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.540 cum	
	Say 0.540 cum @ Rs 1916.05 / cum						Rs 1034.67	
4	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts							
	upto 3.0m from G.L for column	8	0.300		2.000		4.800	
	above 3.0 m to 4.0 m	8	0.300		1.000		2.400	
	Total Quantity						7.200 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						7.200 sqm	
	Say 7.200 sqm @ Rs 863.64 / sqm						Rs 6218.21	
5	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	upto 1.5 m from G.L @100kg/m3	2	0.300	0.300	0.500	100.0	9.000	
	1.5m to 4.5m above G.L@100kg/m3	2	0.300	0.300	2.500	100.0	45.000	
	Total Quantity						54.000 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						54.000 kilogram	
	Say 54.000 kilogram @ Rs 98.30 / kilogram						Rs 5308.20	

6	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On steel work							
		1	54.000			0.05	2.744	
		1	7.200		0.600		4.320	
		2	7.200	0.210			3.024	
	Total Quantity						10.088 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						10.088 sqm	
	Say 10.088 sqm @ Rs 223.32 / sqm						Rs 2252.85	
7	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Side	8	0.300		3.000		7.200	
		2	0.300	0.300			0.180	
	Total Quantity						7.380 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						7.380 sqm	
	Say 7.380 sqm @ Rs 401.21 / sqm						Rs 2960.93	
8	13.39.2 Colour washing such as green, blue or buff to give an even shade: New work (two or more coats) with a base coat of whitening							
	Side	8	0.300		3.000		7.200	
		2	0.300	0.300			0.180	
	Total Quantity						7.380 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						7.380 sqm	
	Say 7.380 sqm @ Rs 45.29 / sqm						Rs 334.24	
9	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Supply and fixing ISHB 300mm of 63kg/m for 7.2m on column over suction well	1	7.200		63.000		453.600	

	Total Quantity						453.600 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						453.600 kg	
	Say 453.600 kg @ Rs 119.79 / kg						Rs 54336.74	
10	od249251/2022_2023 Charges for chain pulley block with travelling trolley of 2 Tonne capacity							
		1					1.000	
	Total Quantity						1.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						1.000 each	
	Say 1.000 each @ Rs 18611.00 / each						Rs 18611.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
9 Providing Advanced odor control mechanism including cost of all (OCU capacity-WW2: 1,650 m3 /hr including installation								
Lump-Sum Total						Rs 1610000.00		
	Provision for GST payments (in %) @						0.0%	
Amount reserved for GST payments						0.00		
Total						11120443.00		
Lumpsum for round off						557.00		
						TOTAL Rs 11121000.00		
						Rounded Total Rs 1,11,21,000		
Rupees One Crore Eleven Lakh Twenty One Thousand Only								

(Cost Index Applied for this estimate is 35.59%)

Data Analysis

Colletion well 6m dia					
1 Specification Code: 2.6.1					

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89
TOTAL					1578.52
Cost of 10.0 cum					1578.52
Cost per cum					157.85
Say					157.85

	Cost index	35.59 %			56.18
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	Total with Cost index				214.03
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2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
TOTAL					675.50
Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

	Cost index 35.59 %				27.92
	Total with Cost index				106.37

3 Specification Code: od226268/2022_2023

od226268/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (6m diameter)

Quantity for 3.0m depth=3.14*3.6*3.6*3=122.08m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPOH) 100.3.5.2 328.41*1.3559	cum	122.08000	445.29	54361.00
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	122.08000	276.83	33795.41
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					88756.41
	cost for 3.0 metre				88756.41
	cost for one metre				29585.47
	say				29585.47

	Add Water Charges @ 1.0%				295.85
	Add CPOH @ 15.0%				4482.19
	Cost index 35.59 %				82.67
	Total with Cost index				34446.20
	Say				34446.20

4 Specification Code: od226271/2022_2023

od226271/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (6m diameter)

Quantity for 3.0m depth= $3.14 \times 3.6 \times 3.6 \times 3 = 122.08 \text{m}^3$

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%= $175.78 \times 1.01 \times 1.15 \times 1.3559 = 276.83$

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.3 $358.24 \times 1.3559 = 485.74$	cum	122.08000	485.74	59299.14
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	122.08000	276.83	33795.41
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					93694.55
	cost for 3.0 metre				93694.55
	cost for one metre				31231.52
	say				31231.52

	Add Water Charges @ 1.0%				312.31
	Add CPOH @ 15.0%				4731.57
	Cost index 35.59 %				82.67
	Total with Cost index				36358.09
	Say				36358.09

5 Specification Code: od226273/2022_2023

od226273/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (6m diameter)

Quantity for 3.0m depth= $3.14 \times 3.6^2 \times 3 = 122.08\text{m}^3$

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%= $175.78 \times 1.01 \times 1.15 \times 1.3559 = 276.83$

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.4 $388.12 \times 1.3559 = 485.74$	cum	122.08000	526.25	64244.60
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	122.08000	276.83	33795.41
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					98640.01
	cost for 3.0 metre				98640.01
	cost for one metre				32880.00
	say				32880.00

	Add Water Charges @ 1.0%				328.80
	Add CPOH @ 15.0%				4981.32
	Cost index 35.59 %				82.67
	Total with Cost index				38272.80
	Say				38272.80

6 Specification Code: od226275/2022_2023

od226275/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (6m diameter)

Quantity for 3.0m depth=3.14*3.6*3.6*3=122.08m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.5 417.95*1.3559 =566.70	cum	122.08000	566.70	69182.74
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	122.08000	276.83	33795.41
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					103578.15
	cost for 3.0 metre				103578.15
	cost for one metre				34526.05
	say				34526.05

	Add Water Charges @ 1.0%				345.26
	Add CPOH @ 15.0%				5230.69
	Cost index 35.59 %				82.67
	Total with Cost index				40184.68
	Say				40184.68

7 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood $26.39 \times 0.038 = 1.00$ cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = $1200/8 = 150$ cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712$ cum Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798$ cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = $0.1586/8 = 0.0198$ cum	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = $53/8 = 6.625$ m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material $(P+Q+R)/6 = (3750.00+0.50+245.12/6)$	metre	6.625	40.00	265.00(R)
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Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations

Cost index	35.59 %		65.54
Total with Cost index			249.69

8 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1

All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00
TOTAL					5977.32

Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

Cost index 35.59 %	2470.89
Total with Cost index	9413.54

9 Specification Code: 5.33.2

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2

All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20

0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level $0.75 \times 2.5 = 1.88$	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL	7026.36
Add Water Charges @ 1%	70.26
TOTAL	7096.62
Add CPOH @ 15%	1064.49
TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

	Cost index 35.59 %				2904.54
	Total with Cost index				11065.64

10 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

11 Specification Code: od226277/2022_2023

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od226277/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

12 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				

0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

TOTAL				5073.95
Add Water Charges @ 1%				50.74
TOTAL				5124.69
Add CPOH @ 15%				768.70
TOTAL				5893.39
Cost of 1.0 cum				5893.39
Say				5893.4

Cost index		35.59 %			2097.46
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	Total with Cost index				7990.86
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13 Specification Code: 10.1

SUBHEAD : 10.0

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				
1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34
AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)					63.17
TOTAL					6512.45

AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)	957.07
TOTAL	7470.00
Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

Cost index	35.59 %				26.59
Total with Cost index					101.29

14 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31

2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL				4578.85
Add Water Charges @ 1%				45.79
TOTAL				4624.64
Add CPOH @ 15%				693.70
TOTAL				5318.34
Cost of 1.0 cum				5318.34
Say				5318.35

Cost index 35.59 %					1892.80
Total with Cost index					7211.15

15 Specification Code: 5.22.6

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6

Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
TOTAL					6241.51
Add Water Charges @ 1%					62.42
TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52
Cost per kilogram					72.50
Say					72.5

	Cost index 35.59 %				25.80
	Total with Cost index				98.30

16 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and

applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25
Cost of 10.0 sqm					1647.25

Cost per sqm	164.72
Say	164.7

Cost index 35.59 %	58.62
Total with Cost index	223.32

17 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95
Cost per cum					190.69
Say					190.7

Cost index 35.59 %	67.87
Total with Cost index	258.57

18 Specification Code: 19.16

SUBHEAD : 19.0**DRAINAGE****19.16**

Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foot rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number 4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) 1st class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
Add Water Charges @ 1% except on A ie on (354.8-62.7=292.1)					2.92

TOTAL	357.72
AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)	44.25
TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

Cost index 35.59 %	143.05
Total with Cost index	545.00

19 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whitening

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46
TOTAL					287.76

Add Water Charges @ 1%	2.88
TOTAL	290.64
Add CPOH @ 15%	43.60
TOTAL	334.24
Cost of 10.0 sqm	334.24
Cost per sqm	33.42
Say	33.4

Cost index 35.59 %	11.89
Total with Cost index	45.29

20 Specification Code: 10.2

SUBHEAD : 10.0

STEEL WORK

10.2

Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				

1007	<p>Structural steel such as tees, angles, channels and R.S. joists</p> <p>(ii) Tiles (flats) 50x12mm: $2 \times 2.7 = 5.4 \text{ m @ } 4.7 \text{ kg/m} = 25.38\text{kg}+$</p> <p>Ties central (flats): $50 \times 10\text{mm } 1 \times 2.80 = 2.8 \text{ m @ } 3.90 \text{ kg/m} = 10.92\text{kg}+$</p> <p>Braces (flats) 40x 10 mm: $2 \times 1.84 = 3.68\text{m @ } 3.9 \text{ kg/m} = 14.35 \text{ kg.}$</p> <p>Total = 50.65 kg+</p> <p>Add wastage @ 5% = 2.53kg</p> <p>Total = 53.18kg. = 0.53 qtl</p>	quintal	1.6	4600.00	7360.00
1009	<p>Flats exceeding 10 mm in thickness</p> <p>(iii) Gusset plates 10 mm thick: $1 \times 0.74 \times 0.35\text{m} = 0.259 \text{ sqm.}+$</p> <p>Shone $4 \times 0.46 \times 0.46 = 0.845 \text{ sqm.}$</p> <p>Total = 1.104 sqm.</p> <p>$1.104 \text{ sqm @ } 78.4 \text{ kg/m} = 86.55 \text{ kg}$</p> <p>12 mm plates at the point of principal rafter and strut: $2 \times 0.3 \times 0.2 = 0.12 \text{ sqm.} +$</p> <p>Tie beam, brace and strut: $2 \times 0.5 \times 0.3 = 0.30 \text{ sqm.} +$</p> <p>Sole plates: $2 \times 0.46 \times 0.46 = 0.42 \text{ sqm.}+$</p> <p>Anchor plate: $2 \times 0.46 \times 0.1 = 0.09\text{sqm.}$</p> <p>Total = 0.93 sqm. Say 1.00 sqm.</p> <p>$1.00 \text{ sqm. @ } 94.4 \text{ kg/m} = 94.40 \text{ kg.}$</p> <p>Total = 180.95 kg</p> <p>Add wastage @ 5% = 9.05 kg.</p> <p>Total = 190.00kg or 1.90 q</p>	quintal	0.53	4600.00	2438.00
1010	<p>Mild steel plates</p> <p>(iv) 16mm dia. 50 mm long rivets = 56 Nos.+</p> <p>Add wastage @ 5 % = 2.8 Nos.</p> <p>Total = 58.8 Nos.</p>	quintal	1.9	4800.00	9120.00

1020	Mild steel rivets (v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	Carriage of Steel Carriage of steel (0.160+0.053+0.091+0.099+0.007+0.005) = 0.415 tonne LABOUR:	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40
0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron 9.5 x 0.4 = 3.80 sqm. + Struts 2.70 x 0.16 = 0.43 sqm. + Ties 5.4x0.124 = 0.67 sqm. + Braces 2 x 1.84 x 0.12 = 0.44 sqm. + Ties 2.8x0.12 = 0.34 sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number 13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

Add Water Charges @ 1% except on A ie on (30081.43-249.92=29831.51)				298.32
TOTAL				30379.75
Add CPOH @ 15% except on A ie on (30379.75-249.92=30129.83)				4519.47
TOTAL				34898.25

Cost of 395.0 kg	34898.25
Cost of 1 kg	88.35
Say	88.35

Cost index	35.59 %				31.44
Total with Cost index					119.79

Grit/Screen Chamber 3m dia
1 Specification Code: 2.6.1

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63

Add CPOH @ 15%	205.89
TOTAL	1578.52
Cost of 10.0 cum	1578.52
Cost per cum	157.85
Say	157.85

Cost index 35.59 %	56.18
Total with Cost index	214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
TOTAL					675.50
Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

	Cost index 35.59 %				27.92
	Total with Cost index				106.37

3 Specification Code: od226267/2022_2023

od226267/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m

Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 356.61*1.3559 =483.52	cum	35.82000	483.52	17319.69
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					27835.74
	cost for 3.0 metre				27835.74
	cost for one metre				9278.58
	say				9278.58

	Add Water Charges @ 1.0%				92.78
	Add CPOH @ 15.0%				1405.70
	Cost index 35.59 %				82.67

	Total with Cost index				10859.75
	Say				10859.75

4 Specification Code: od226270/2022_2023

od226270/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m

Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 389.02.19*1.3559 =527.48	cum	35.82000	527.48	18894.33
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					29410.38
	cost for 3.0 metre				29410.38
	cost for one metre				9803.46
	say				9803.46

	Add Water Charges @ 1.0%				98.03
	Add CPOH @ 15.0%				1485.22
	Cost index 35.59 %				82.67

	Total with Cost index				11469.39
	Say				11469.39

5 Specification Code: od226274/2022_2023

od226274/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m

Quantity for 3.0m depth= $3.14 \times 1.95 \times 1.95 \times 3 = 35.82\text{m}^3$

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%= $175.78 \times 1.01 \times 1.15 \times 1.3559 = 276.83$

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.4 $421.44 \times 1.3559 =$	cum	35.82000	571.43	20468.62
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					30984.67
	cost for 3.0 metre				30984.67
	cost for one metre				10328.22
	say				10328.22

	Add Water Charges @ 1.0%				103.28
	Add CPOH @ 15.0%				1564.72
	Cost index 35.59 %				82.67

	Total with Cost index				12078.90
	Say				12078.90

6 Specification Code: od235344/2022_2023

od235344/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)

Quantity for 3.0m depth= $3.14 \times 2.1^2 \times 3 = 41.5422 \text{ m}^3$

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%= $175.78 \times 1.01 \times 1.15 \times 1.3559 = 276.83$

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) $545.99 \times 1.3559 = 740.307$	cum	41.54220	740.31	30753.98
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	41.54220	276.83	11500.13
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					42854.11
	cost for 3.0 metre				42854.11
	cost for one metre				14284.70
	say				14284.70

	Add Water Charges @ 1.0%				142.84
	Add CPOH @ 15.0%				2164.13
	Cost index 35.59 %				82.67

	Total with Cost index				16674.35
	Say				16674.35

7 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	<p>Details of cost for 26.39 sqm</p> <p>Surface area</p> <p>Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm</p> <p>MATERIAL:</p> <p>Assuming that the timber will become unserviceable after being used 8 times</p> <p>planks 38 mm (Second class kail wood</p> <p>$26.39 \times 0.038 = 1.00$ cum</p> <p>Wastage 2% = 0.20 cum.</p> <p>Total = 1.20 cum . or 1200 cudm.</p> <p>Qty for cost using once = $1200/8 = 150$ cudm</p>				

1198	Second class kail wood in planks 2nd class kail wood battens Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712 \text{ cum}$ Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798 \text{ cum}$ Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = $0.1586/8 = 0.0198 \text{ cum}$	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside $25 \times 1.00 = 25.00 \text{ m}$ Outside $28 \times 1.00 = 28.00 \text{ m}$ Total = 53.00 m Qty for cost using once = $53/8 = 6.625 \text{ m}$ Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Cost index	35.59 %				65.54
Total with Cost index					249.69

8 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1

All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00

0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL					5977.32
Add Water Charges @ 1%					59.77
TOTAL					6037.09
Add CPOH @ 15%					905.56
TOTAL					6942.65
Cost of 1.0 cum					6942.65
Say					6942.65

Cost index 35.59 %					2470.89
Total with Cost index					9413.54

9 Specification Code: 5.33.2

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content

considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2 All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30

0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level $0.75 \times 2.5 = 1.88$	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL					7026.36
Add Water Charges @ 1%					70.26
TOTAL					7096.62
Add CPOH @ 15%					1064.49
TOTAL					8161.11
Cost of 1.0 cum					8161.11
Say					8161.1

	Cost index 35.59 %				2904.54
	Total with Cost index				11065.64

10 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40

2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80

TOTAL	52.12
Add Water Charges @ 1%	.52
TOTAL	52.64
Add CPOH @ 15%	7.90
TOTAL	60.54
Cost of 1.0 cum	60.54
Say	60.55

Cost index 35.59 %	21.55
Total with Cost index	82.10

11 Specification Code: od226277/2022_2023

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od226277/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

12 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90

0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

TOTAL					5073.95
Add Water Charges @ 1%					50.74
TOTAL					5124.69
Add CPOH @ 15%					768.70
TOTAL					5893.39
Cost of 1.0 cum					5893.39
Say					5893.4

Cost index 35.59 %					2097.46
Total with Cost index					7990.86

Other Engineering Organisations

13 Specification Code: 10.1

SUBHEAD : 10.0

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				

1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34

AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)					63.17
TOTAL					6512.45
AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)					957.07
TOTAL					7470.00
Cost of 100.0 kilogram					7470.00
Cost of 1 kilogram					74.70
Say					74.7

	Cost index 35.59 %				26.59
	Total with Cost index				101.29

14 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04
TOTAL					4578.85
Add Water Charges @ 1%					45.79
TOTAL					4624.64

Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

Cost index 35.59 %	1892.80
Total with Cost index	7211.15

15 Specification Code: 5.22.5

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.5 Hard drawn steel wire fabric

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Hard drawn steel wire fabric 100kg/7.75 kg = 12.903 sqm Wastage 5% = 0.64 sqm Total = 13.548 sqm				
1021	Hard drawn steel wire fabric	sqm	13.548	430.00	5825.64
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For cutting and laying in position	L.S	26.0	2.00	52.00
0103	Blacksmith 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	1.5	558.00	837.00
9999	Sundries-and binding wire	L.S	13.52	2.00	27.04

TOTAL	6887.17
Add Water Charges @ 1%	68.87
TOTAL	6956.04
Add CPOH @ 15%	1043.41
TOTAL	7999.45
Cost of 100.0 kilogram	7999.45
Cost per kilogram	79.99
Say	80.0

Cost index 35.59 %	28.47
Total with Cost index	108.47

16 Specification Code: 2.25

2.25

Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95

Cost of 10.0 cum	1906.95
Cost per cum	190.69
Say	190.7

Cost index 35.59 %	67.87
Total with Cost index	258.57

17 Specification Code: 19.16

SUBHEAD : 19.0

DRAINAGE

19.16

Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foot rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64

4.2.5	Rate as per item Number 4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) 1st class	Day	0.02	738.00	14.76
0124	Mason (brick layer) 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90

Add Water Charges @ 1% except on A ie on (354.8-62.7=292.1)					2.92
TOTAL					357.72
Add CPOH @ 15% except on A ie on (357.72-62.7=295.02)					44.25
TOTAL					401.95
Cost of 1.0 each					401.95
Cost of 1 each					401.95
Say					401.95

Other Engineering Organisations

Cost index 35.59 %				143.05
Total with Cost index				545.00

18 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whitening

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12

9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46

TOTAL					287.76
Add Water Charges @ 1%					2.88
TOTAL					290.64
Add CPOH @ 15%					43.60
TOTAL					334.24
Cost of 10.0 sqm					334.24
Cost per sqm					33.42
Say					33.4

Other Engineering Organisations

	Cost index	35.59 %			11.89
	Total with Cost index				45.29

19 Specification Code: 10.2

SUBHEAD : 10.0

STEEL WORK

10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
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	<p>Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL:</p> <p>(i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+</p> <p>Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg</p> <p>Total = 151.95 kg +</p> <p>Add wastage @ 5% = 7.60 kg</p> <p>Total = 159.55 kg. = 1.60 q</p>				
1007	<p>Structural steel such as tees, angles, channels and R.S. joists</p> <p>(ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+</p> <p>Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+</p> <p>Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg.</p> <p>Total = 50.65 kg+</p> <p>Add wastage @ 5% = 2.53kg</p> <p>Total = 53.18kg. = 0.53 qtl</p>	quintal	1.6	4600.00	7360.00

1009	<p>Flats exceeding 10 mm in thickness</p> <p>(iii) Gusset plates 10 mm thick: $1 \times 0.74 \times 0.35 \text{m} = 0.259 \text{ sqm.} +$ Shone $4 \times 0.46 \times 0.46 = 0.845 \text{ sqm.}$ Total = 1.104 sqm. $1.104 \text{ sqm} @ 78.4 \text{ kg/m} = 86.55 \text{ kg}$ 12 mm plates at the point of principal rafter and strut: $2 \times 0.3 \times 0.2 = 0.12 \text{ sqm.} +$ Tie beam, brace and strut: $2 \times 0.5 \times 0.3 = 0.30 \text{ sqm.} +$ Sole plates: $2 \times 0.46 \times 0.46 = 0.42 \text{ sqm.} +$ Anchor plate: $2 \times 0.46 \times 0.1 = 0.09 \text{ sqm.}$ Total = 0.93 sqm. Say 1.00 sqm. $1.00 \text{ sqm.} @ 94.4 \text{ kg/m} = 94.40 \text{ kg.}$ Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00 kg or 1.90 q</p>	quintal	0.53	4600.00	2438.00
1010	<p>Mild steel plates</p> <p>(iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.</p>	quintal	1.9	4800.00	9120.00
1020	<p>Mild steel rivets</p> <p>(v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm</p>	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	<p>Carriage of Steel</p> <p>Carriage of steel $(0.160 + 0.053 + 0.091 + 0.099 + 0.007 + 0.005) =$ 0.415 tonne LABOUR:</p>	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40

0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron $9.5 \times 0.4 = 3.80$ sqm. + Struts $2.70 \times 0.16 = 0.43$ sqm. + Ties $5.4 \times 0.124 = 0.67$ sqm. + Braces $2 \times 1.84 \times 0.12 = 0.44$ sqm. + Ties $2.8 \times 0.12 = 0.34$ sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number 13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

Add Water Charges @ 1% except on A ie on (30081.43-249.92=29831.51)				298.32
TOTAL				30379.75
Add CPOH @ 15% except on A ie on (30379.75-249.92=30129.83)				4519.47
TOTAL				34898.25
Cost of 395.0 kg				34898.25
Cost of 1 kg				88.35
Say				88.35

	Cost index 35.59 %				31.44
	Total with Cost index				119.79

20 Specification Code: od247983/2022_2023

od247983/2022_2023 :Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal

seating, spindle made of Stainless steel, CI head stock with gear arrangement and hand wheel fitted in well.

Code	Description	Unit	Quantity	Rate	Amount
MR	Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangement and hand wheel fitted in well. 	each	1.00000	248251.00	248251.00
TOTAL					248251.00
	cost for 1.1615 each				248251.00
	cost for one each				213733.10
	say				213733.10

	Add Water Charges @ 1.0%				2137.33
	Add CPOH @ 15.0%				32380.56
	Cost index 35.59 %				0.00
	Total with Cost index				248251.00
	Say				248251.00

Silt Pit 1.5mx1.5mx1.2m

1 Specification Code: 2.6.1

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89
TOTAL					1578.52
Cost of 10.0 cum					1578.52
Cost per cum					157.85
Say					157.85

	Cost index 35.59 %				56.18
	Total with Cost index				214.03

2 Specification Code: 2.26.1

2.26

Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80

TOTAL					675.50
Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

	Cost index 35.59 %			27.92
	Total with Cost index			106.37

3 Specification Code: 2.27

2.27

Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62

0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95

TOTAL					14597.33
Add Water Charges @ 1%					145.97
TOTAL					14743.30
Add CPOH @ 15%					2211.49
TOTAL					16954.79
Cost of 10.0 cum					16954.79
Cost per cum					1695.48
Say					1695.5

Cost index 35.59 %					603.43
Total with Cost index					2298.93

Other Engineering Organisations

4 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00

0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL				4578.85
Add Water Charges @ 1%				45.79
TOTAL				4624.64
Add CPOH @ 15%				693.70
TOTAL				5318.34
Cost of 1.0 cum				5318.34
Say				5318.35

Cost index 35.59 %					1892.80
Total with Cost index					7211.15

5 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1

All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00

0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL					5977.32
Add Water Charges @ 1%					59.77
TOTAL					6037.09
Add CPOH @ 15%					905.56
TOTAL					6942.65
Cost of 1.0 cum					6942.65
Say					6942.65

Cost index 35.59 %					2470.89
Total with Cost index					9413.54

6 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
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	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80

	TOTAL	52.12
	Add Water Charges @ 1%	.52
	TOTAL	52.64
	Add CPOH @ 15%	7.90
	TOTAL	60.54
	Cost of 1.0 cum	60.54
	Say	60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

7 Specification Code: od226277/2022_2023

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od226277/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60

TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

8 Specification Code: 5.22.6

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6

Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in position	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL	6241.51
Add Water Charges @ 1%	62.42
TOTAL	6303.93
Add CPOH @ 15%	945.59
TOTAL	7249.52
Cost of 100.0 kilogram	7249.52
Cost per kilogram	72.50
Say	72.5

Cost index 35.59 %	25.80
Total with Cost index	98.30

9 Specification Code: 13.52.1

13.52

Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1

On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92

9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25
Cost of 10.0 sqm					1647.25
Cost per sqm					164.72
Say					164.7

Cost index 35.59 %					58.62
Total with Cost index					223.32

10 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
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	<p>Details of cost for 26.39 sqm</p> <p>Surface area</p> <p>Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm</p> <p>MATERIAL:</p> <p>Assuming that the timber will become unserviceable after being used 8 times</p> <p>planks 38 mm (Second class kail wood</p> <p>$26.39 \times 0.038 = 1.00$ cum</p> <p>Wastage 2% = 0.20 cum.</p> <p>Total = 1.20 cum . or 1200 cudm.</p> <p>Qty for cost using once = $1200/8 = 150$ cudm</p>				
1198	<p>Second class kail wood in planks</p> <p>2nd class kail wood battens</p> <p>Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712$ cum</p> <p>Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798$ cum</p> <p>Total = 0.1510 cum.</p> <p>Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm</p> <p>Qty for cost using once = $0.1586/8 = 0.0198$ cum</p>	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)
0302	<p>Safeda ballies 125 mm diameter</p> <p>Inside $25 \times 1.00 = 25.00$ m</p> <p>Outside $28 \times 1.00 = 28.00$ m</p> <p>Total = 53.00 m</p> <p>Qty for cost using once = $53/8 = 6.625$ m</p> <p>Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material</p> <p>$(P+Q+R)/6 = (3750.00+0.50+245.12/6)$</p>	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Cost index	35.59 %				65.54
Total with Cost index					249.69

11 Specification Code: 2.25

2.25

Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95

Cost per cum	190.69
Say	190.7

Cost index 35.59 %	67.87
Total with Cost index	258.57

Valve chamber 2.3mx3.8mx1.9m
1 Specification Code: 2.6.1

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89

TOTAL	1578.52
Cost of 10.0 cum	1578.52
Cost per cum	157.85
Say	157.85

Cost index 35.59 %	56.18
Total with Cost index	214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
TOTAL					675.50
Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

Cost index 35.59 %	27.92
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	Total with Cost index				106.37
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3 Specification Code: 2.27

2.27

Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
Other Engineering Organisations TOTAL					14597.33
Add Water Charges @ 1%					145.97
TOTAL					14743.30
Add CPOH @ 15%					2211.49
TOTAL					16954.79
Cost of 10.0 cum					16954.79
Cost per cum					1695.48
Say					1695.5

	Cost index 35.59 %				603.43
	Total with Cost index				2298.93

4 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90

9999	Sundries-	L.S	13.52	2.00	27.04
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TOTAL					4578.85
Add Water Charges @ 1%					45.79
TOTAL					4624.64
Add CPOH @ 15%					693.70
TOTAL					5318.34
Cost of 1.0 cum					5318.34
Say					5318.35

Cost index 35.59 %					1892.80
Total with Cost index					7211.15

5 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50

0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Other Engineering Organisations	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65

Cost of 1.0 cum	6942.65
Say	6942.65

Cost index 35.59 %	2470.89
Total with Cost index	9413.54

6 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

7 Specification Code: 5.22.6

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6

Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in position	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
TOTAL					6241.51
Add Water Charges @ 1%					62.42
TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52

Cost per kilogram	72.50
Say	72.5

Cost index 35.59 %	25.80
Total with Cost index	98.30

8 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	<p>Details of cost for 26.39 sqm</p> <p>Surface area</p> <p>Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm</p> <p>MATERIAL:</p> <p>Assuming that the timber will become unserviceable after being used 8 times</p> <p>planks 38 mm (Second class kail wood</p> <p>$26.39 \times 0.038 = 1.00$ cum</p> <p>Wastage 2% = 0.20 cum.</p> <p>Total = 1.20 cum . or 1200 cudm.</p> <p>Qty for cost using once = $1200/8 = 150$ cudm</p>				

1198	Second class kail wood in planks 2nd class kail wood battens Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712 \text{ cum}$ Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798 \text{ cum}$ Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = $0.1586/8 = 0.0198 \text{ cum}$	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside $25 \times 1.00 = 25.00 \text{ m}$ Outside $28 \times 1.00 = 28.00 \text{ m}$ Total = 53.00 m Qty for cost using once = $53/8 = 6.625 \text{ m}$ Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Cost index	35.59 %				65.54
Total with Cost index					249.69

9 Specification Code: 5.9.2

SUBHEAD 5.0

REINFORCED CEMENT CONCRETE

5.9

Centering and shuttering including strutting, etc. and removal of form for:

5.9.2

Walls (any thickness) including attached pilasters, buttresses, plinth and string courses etc.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 7.9m long and 1.00m high wall Area of contact $2 \times 7.9 \times 1.0 = 15.8$ sqm MATERIAL: Assuming shuttering material will become unserviceable after use of 40 times Adding for maintenance @ 10% of cost Taking salvage value after full use of material @ 25% of cost				
7319	wall form panel 1250x500 mm $2 \times 3 \times 2 \times 2 = 24$ Nos. Qty taken for cost of using once = $24 \times 0.85 / 40 = 0.51$	each	0.51	860.00	438.60
7327	100 mm channel shoulder 2.5 m long $4 \times 2 = 8$ Qty taken for cost of using once = $8 \times 0.85 / 40 = 0.17$	each	0.17	910.00	154.70
7328	Double clip (bridge clip) $2 \times 6 \times 2 = 24$ Qty taken for cost of using once = $24 \times 0.85 / 40 = 0.51$	each	0.51	76.00	38.76

7329	Single clip 2x3x2 = 12 Qty taken for cost of using once = $12 \times 0.85 / 40 = 0.255$	each	0.255	59.00	15.05
7330	M.S. Tube 40 mm dia 2x2x8m = 32m Qty taken for cost of using once = $32 \times 0.85 / 40 = 0.68$	metre	0.68	215.00	146.20
9999	Sundries-Qty taken for cost of using once = $1300 \times 0.85 / 40 = 27.62$	L.S	27.62	2.00	55.24
9977	Carriage LABOUR	L.S	78.0	2.00	156.00
0116	Fitter(grade1)	Day	3.5	738.00	2583.00
0114	Beldar	Day	6.0	558.00	3348.00
9999	Sundries- shuttering oil	L.S	78.0	2.00	156.00
9999	Sundries-	L.S	52.0	2.00	104.00
Other Engineering Organisations TOTAL					7195.55
Add Water Charges @ 1%					71.96
TOTAL					7267.51
Add CPOH @ 15%					1090.13
Cost of 15.8 Sq. m.					8357.64
Cost per 1 Sq. m.					528.96
Say					528.95

	Cost index 35.59 %				188.25
	Total with Cost index				717.20

10 Specification Code: 5.9.16.1

5.9 Centering and shuttering including strutting, etc. and removal of form for:**5.9.16** Edges of slabs and breaks in floors and walls**5.9.16.1** Under 20 cm wide

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a 3mx3m slab 15cms thick 12m edge Length MATERIAL: Assuming that the timber will become unserviceable after being used 8 times				
1198	Second class kail wood in planks (i) Planks 30 mm thick (2nd class Kail wood or equivalent local soft wood) $4 \times 3 \times 0.15 \times 0.030 = 0.54 \text{ cum}$ Wastage @ 5% = 0.003 cum. Total = 0.057 cum 57 cudm Qty taken for cost of using once = $57/8 = 7.125 \text{ cudm}$	10 cud m	7.125	260.00	185.25
1197	Second class kail wood in scantling (ii) Battens 75 mm x 100 mm (2nd class Kail wood) Horizontal $2 \times 4 \times 0.075 \times 0.1 \times 0.5 = 0.030$ Horizontal $2 \times 4 \times 0.075 \times 0.1 \times 1.5 = 0.090$ (iii) Vertical battens $16 \times 0.15 \times 0.075 \times 0.030 \text{m} = 0.0054$ (iv) Struts $16 \times 0.25 \times 0.07 \times 0.075 = 0.0225$ Total = 0.1479 Wastage @ 5% = 0.0074 Total = 0.1553 cum = 155 cudm Qty taken for cost of using once = $155/8 = 19.375 \text{ cudm}$	10 cud m	19.375	260.00	503.75

2204	Carriage of Timber Planks = 0.057 cum. Batte4ns = 0.057 cum. Total = 0.212 cum. Qty taken for cost of using once = $0.212/8 = 0.0265$ cum LABOUR: For assembling erection dismantling & cleaning	cum	0.0265	118.59	3.14
0112	Carpenter 2nd class	Day	0.81	679.00	549.99
0114	Beldar	Day	0.54	558.00	301.32
9999	Sundries-	L.S	5.2	2.00	10.40

TOTAL					1553.85
Add Water Charges @ 1%					15.54
TOTAL					1569.39
Add CPOH @ 15%					235.41
Other Engineering Organisations TOTAL					1804.80
Cost of 12.0 metre					1804.80
Cost per metre					150.40
Say					150.4

Cost index 35.59 %					53.53
Total with Cost index					203.93

11 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
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	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40

	TOTAL	1641.80
	Add Water Charges @ 1%	16.42
	TOTAL	1658.22
	Add CPOH @ 15%	248.73
	TOTAL	1906.95
	Cost of 10.0 cum	1906.95
	Cost per cum	190.69
	Say	190.7

	Cost index 35.59 %	67.87
	Total with Cost index	258.57

12 Specification Code: 19.16

SUBHEAD : 19.0

DRAINAGE

19.16

Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded

stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foot rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number 4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) 1st class	Day	0.02	738.00	14.76
0124	Mason (brick layer) 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
Add Water Charges @ 1% except on A ie on (354.8-62.7=292.1)					2.92
TOTAL					357.72
Add CPOH @ 15% except on A ie on (357.72-62.7=295.02)					44.25
TOTAL					401.95
Cost of 1.0 each					401.95
Cost of 1 each					401.95
Say					401.95

	Cost index 35.59 %				143.05
	Total with Cost index				545.00

Pumpsets

1 Specification Code: od235678/2022_2023

od235678/2022_2023 :Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 20 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years

MR for Submercible pumpset -Av Rs. 18135 (based on KWA estimate approved rates)

Hence for 20HP pump= 20hp@Rs.18135=RS. 362700

Code	Description	Unit	Quantity	Rate	Amount
MR	20hp pumpset	each set	1.00000	362700.00	362700.00
TOTAL					362700.00
cost for one each set					362700.00
	say				362700.00

	Add Water Charges @ 1.0%				3627.00
	Add CPOH @ 15.0%				54949.05
	Cost index 35.59 %				0.00
	Total with Cost index				421276.05
	Say				421276.05

2 Specification Code: od235682/2022_2023

od235682/2022_2023 :Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 50 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years

MR for Submercible pumpset -Av Rs. 18135 (based on KWA estimate approved rates)

Hence for 50HP pump=30hp@Rs.18135=RS. 906750

Code	Description	Unit	Quantity	Rate	Amount
MR	50hp pumpset	each set	1.00000	906750.00	906750.00
TOTAL					906750.00
cost for one each set					906750.00
	say				906750.00

	Add Water Charges @ 1.0%				9067.50
	Add CPOH @ 15.0%				137372.62
	Cost index 35.59 %				0.00
	Total with Cost index				1053190.13
	Say				1053190.13

Construction of pump room

1 Specification Code: od248169/2022_2023

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od248169/2022_2023 :RCC Roofed building with required opening of Doors and Windows in any hard wood

such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in verified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty. The sanitary/Plumping and Electrical works are followed by standard specifications.

Code	Description	Unit	Quantity	Rate	Amount
MR	RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in verified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty. The sanitary/Plumping and Electrical works are followed by standard specifications. Plinth area Rates 2012 CPWD	sqm	1.00000	19000.00	19000.00
MR	Add 60% cost Index for 2012 items	sqm	0.60000	19000.00	11400.00
TOTAL					30400.00
cost for one sqm					30400.00
	say				30400.00

	Add Water Charges @ 1.0%				304.00
	Add CPOH @ 15.0%				4605.60
	Cost index 35.59 %				0.00
	Total with Cost index				35309.60
	Say				35309.60

Construction of Column & Erection of ISMB

1 Specification Code: 5.33.2

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2

All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00

0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level $0.75 \times 2.5 = 1.88$	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL					7026.36
Add Water Charges @ 1%					70.26
TOTAL					7096.62
Add CPOH @ 15%					1064.49
TOTAL					8161.11
Cost of 1.0 cum					8161.11
Say					8161.1

	Cost index 35.59 %				2904.54
	Total with Cost index				11065.64

2 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

3 Specification Code: od248928/2022_2023

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od248928/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
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MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60

TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

4 Specification Code: 5.9.6

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.6 Columns, Pillars, Piers, Abutments, Posts and Struts

Code	Description	Unit	Quantity	Rate	Amount
	<p>Details of cost for 4.5 sqm.</p> <p>Size of column 450x450mm and 2.5 m high</p> <p>Area of contact = $4 \times 0.45 \times 2.5 = 4.5$ sqm</p> <p>MATERIAL: Assuming shuttering will become unserviceable after use of 40 times</p> <p>Add maintenance charges @ 10 % of cost of material</p> <p>Less salvage value of material after full use @ 25% of cost of material</p>				
7331	<p>Wall form panel 1250x450xmm</p> <p>Qty taken for cost of using once = $8 \times 0.85 / 40 = 0.17$</p>	each	0.17	860.00	146.20

7332	Corner angle 45x45x5 mm 2.50 long Qty taken for cost of using once = $4 \times 0.85 / 40 = 0.085$	each	0.085	255.00	21.68
7333	Column clamp 450x1070 mm Qty taken for cost of using once = $5 \times 0.85 / 40 = 0.1063$	each	0.1063	965.00	102.58
7334	Prop 2 m (2-3.5m) Qty taken for cost of using once = $4 \times 0.85 / 40 = 0.085$	each	0.085	635.00	53.98
9999	Sundries-Qty taken for cost of using once = $1300 \times 0.85 / 40 = 27.62$	L.S	27.62	2.00	55.24
9977	Carriage LABOUR	L.S	52.0	2.00	104.00
0116	Fitter(grade1)	Day	1.0	738.00	738.00
0114	Beldar	Day	2.0	558.00	1116.00
9999	Sundries-Shuttering oil	L.S	39.0	2.00	78.00
9999	Sundries-Carriage	L.S	26.0	2.00	52.00

TOTAL				2467.68
Add Water Charges @ 1%				24.68
TOTAL				2492.36
Add CPOH @ 15%				373.85
TOTAL				2866.21
Cost of 4.5 sqm				2866.21
Cost per sqm				636.94
Say				636.95

Cost index 35.59 %					226.69
Total with Cost index					863.64

5 Specification Code: 5.22.6

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6

Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in position	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
TOTAL					6241.51
Add Water Charges @ 1%					62.42
TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52
Cost per kilogram					72.50
Say					72.5

	Cost index 35.59 %				25.80
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	Total with Cost index				98.30
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6 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
TOTAL					1418.21
Add Water Charges @ 1%					14.18

TOTAL	1432.39
Add CPOH @ 15%	214.86
TOTAL	1647.25
Cost of 10.0 sqm	1647.25
Cost per sqm	164.72
Say	164.7

Cost index 35.59 %	58.62
Total with Cost index	223.32

7 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand)				
3.3	Rate as per item Number 3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43

0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL					2547.60
Add Water Charges @ 1%					25.48
TOTAL					2573.08
Add CPOH @ 15%					385.96
TOTAL					2959.04
Cost of 10.0 sqm					2959.04
Cost per sqm					295.90
Say					295.9

Cost index 35.59 %					105.31
Total with Cost index					401.21

Other Engineering Organisations

8 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:**13.39.2** New work (two or more coats) with a base coat of whitening

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80

9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46

TOTAL					287.76
Add Water Charges @ 1%					2.88
TOTAL					290.64
Add CPOH @ 15%					43.60
TOTAL					334.24
Cost of 10.0 sqm					334.24
Cost per sqm					33.42
Say					33.4

Cost index 35.59 %					11.89
Total with Cost index					45.29

Other Engineering Organisations

9 Specification Code: 10.2

SUBHEAD : 10.0**STEEL WORK****10.2**

Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
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	<p>Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL:</p> <p>(i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+</p> <p>Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg</p> <p>Total = 151.95 kg +</p> <p>Add wastage @ 5% = 7.60 kg</p> <p>Total = 159.55 kg. = 1.60 q</p>				
1007	<p>Structural steel such as tees, angles, channels and R.S. joists</p> <p>(ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+</p> <p>Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+</p> <p>Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg.</p> <p>Total = 50.65 kg+</p> <p>Add wastage @ 5% = 2.53kg</p> <p>Total = 53.18kg. = 0.53 qtl</p>	quintal	1.6	4600.00	7360.00

1009	<p>Flats exceeding 10 mm in thickness</p> <p>(iii) Gusset plates 10 mm thick: $1 \times 0.74 \times 0.35 \text{m} = 0.259 \text{ sqm.} +$ Shone $4 \times 0.46 \times 0.46 = 0.845 \text{ sqm.}$ Total = 1.104 sqm. $1.104 \text{ sqm} @ 78.4 \text{ kg/m} = 86.55 \text{ kg}$ 12 mm plates at the point of principal rafter and strut: $2 \times 0.3 \times 0.2 = 0.12 \text{ sqm.} +$ Tie beam, brace and strut: $2 \times 0.5 \times 0.3 = 0.30 \text{ sqm.} +$ Sole plates: $2 \times 0.46 \times 0.46 = 0.42 \text{ sqm.} +$ Anchor plate: $2 \times 0.46 \times 0.1 = 0.09 \text{ sqm.}$ Total = 0.93 sqm. Say 1.00 sqm. $1.00 \text{ sqm.} @ 94.4 \text{ kg/m} = 94.40 \text{ kg.}$ Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00 kg or 1.90 q</p>	quintal	0.53	4600.00	2438.00
1010	<p>Mild steel plates</p> <p>(iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.</p>	quintal	1.9	4800.00	9120.00
1020	<p>Mild steel rivets</p> <p>(v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm</p>	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	<p>Carriage of Steel</p> <p>Carriage of steel $(0.160 + 0.053 + 0.091 + 0.099 + 0.007 + 0.005) =$ 0.415 tonne LABOUR:</p>	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40

0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron $9.5 \times 0.4 = 3.80$ sqm. + Struts $2.70 \times 0.16 = 0.43$ sqm.+ Ties $5.4 \times 0.124 = 0.67$ sqm.+ Braces $2 \times 1.84 \times 0.12 = 0.44$ sqm. + Ties $2.8 \times 0.12 = 0.34$ sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number 13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

Add Water Charges @ 1% except on A ie on (30081.43-249.92=29831.51)				298.32
TOTAL				30379.75
Add CPOH @ 15% except on A ie on (30379.75-249.92=30129.83)				4519.47
TOTAL				34898.25
Cost of 395.0 kg				34898.25
Cost of 1 kg				88.35
Say				88.35

	Cost index 35.59 %				31.44
	Total with Cost index				119.79

10 Specification Code: od249251/2022_2023

od249251/2022_2023 :Charges for chain pulley block with travelling trolley of 2 Tonne capacity

Code	Description	Unit	Quantity	Rate	Amount
MR	Pulley Block - 2 Tonne	each	1.00000	14201.00	14201.00
MR	Extra length	metre	6.00000	735.00	4410.00
TOTAL					18611.00
	cost for 1.1615 each				18611.00
	cost for one each				16023.25
	say				16023.25

	Add Water Charges @ 1.0%				160.23
	Add CPOH @ 15.0%				2427.52
	Cost index 35.59 %				0.00
	Total with Cost index				18611.00
	Other Engineering Say Organisations				18611.00

PRICE

Sewerage Scheme- Construction of wet well 3(Thevara well) (Block7) , Grit /Screen Chamber and connected works at Elamkulam STP

General Abstract

(Dsr year: **2018**, Cost Index Applied for this estimate is **35.59%**)

SI No	Heading Description	Amount
1	Wet well 5m dia	2571676.08
2	Grit/Screen Chamber 3m dia	1392773.80
3	Silt Pit 1.5mx1.5mx1.2m	83922.07
4	Valve chamber 2.3mx3.8mx1.9m	242957.82
5	Pumpsets	1053190.11
6	Collection Well 3m Dia	1038841.42
7	Odour control arrangements	1211564.65
8	Construction of pump room	1017340.19
9	Cost for generator pedestal and mounting structure with roof sheet	100000.00
10	Construction of Column & Erection of ISMB	97076.62
Provision for GST payments (in %) @		0.0%
Amount reserved for GST payments		0.00
Total		8809343.00
Lumpsum for round off		657.00
		TOTAL Rs 8810000.00
Other Engineering Organisations		Rounded Total Rs 88,10,000
		Rupees Eighty Eight Lakh Ten Thousand Only

(Cost Index Applied for this estimate is 35.59%)

PRICE

Sewerage Scheme- Construction of wet well 3(Thevara well) (Block7) , Grit /Screen Chamber and connected works at Elamkulam STP

Abstract Estimate

(Dsr year: **2018**, Cost Index Applied for this estimate is **35.59%**)

1 Wet well 5m dia		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed. All kinds of soil	
Net Total Quantity		76.931 cum
Say 76.931 cum @ Rs 214.03 / cum		Rs 16465.54
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. All kinds of soil	
Net Total Quantity		19.233 cum
Say 19.233 cum @ Rs 106.37 / cum		Rs 2045.81
3	od235676/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (For 5m diameter R1)	
Net Total Quantity		1.000 metre
Say 1.000 metre @ Rs 25625.42 / metre		Rs 25625.42
4	od236568/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (For 5m diameter R1)	
Net Total Quantity		1.500 metre
Say 1.500 metre @ Rs 27040.25 / metre		Rs 40560.38
5	od236677/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (For 5m diameter R1)	
Net Total Quantity		1.500 metre
Say 1.500 metre @ Rs 28461.85 / metre		Rs 42692.77

6	od247420/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (For 5m diameter R1)	
Net Total Quantity		0.410 metre
Say 0.410 metre @ Rs 29879.56 / metre		Rs 12250.62
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		291.124 sqm
Say 291.124 sqm @ Rs 249.69 / sqm		Rs 72690.75
8	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		72.763 cum
Say 72.763 cum @ Rs 9413.54 / cum		Rs 684957.41
9	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
Net Total Quantity		10.551 cum
Say 10.551 cum @ Rs 11065.64 / cum		Rs 116753.57
10	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		83.314 cum
Say 83.314 cum @ Rs 82.10 / cum		Rs 6840.08
11	od226292/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	

Net Total Quantity		83.314 cum
Say 83.314 cum @ Rs 1916.05 / cum		Rs 159633.79
12	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
Net Total Quantity		4.907 cum
Say 4.907 cum @ Rs 7990.86 / cum		Rs 39211.15
13	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		329.010 kilogram
Say 329.010 kilogram @ Rs 101.29 / kilogram		Rs 33325.42
14	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		9.848 cum
Say 9.848 cum @ Rs 7211.15 / cum		Rs 71015.41
15	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		10247.620 kilogram
Say 10247.620 kilogram @ Rs 98.30 / kilogram		Rs 1007341.05
16	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
Net Total Quantity		512.382 sqm
Say 512.382 sqm @ Rs 223.32 / sqm		Rs 114425.15
17	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		37.681 cum
Say 37.681 cum @ Rs 258.57 / cum		Rs 9743.18

18	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
Net Total Quantity		22.000 each
Say 22.000 each @ Rs 545.00 / each		Rs 11990.00
19	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whitening	
Net Total Quantity		30.019 sqm
Say 30.019 sqm @ Rs 45.29 / sqm		Rs 1359.56
20	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		857.743 kg
Say 857.743 kg @ Rs 119.79 / kg		Rs 102749.03
Other Engineering Organisations 2 Grit/Screen Chamber 3m dia		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		40.836 cum
Say 40.836 cum @ Rs 214.03 / cum		Rs 8740.13
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		10.209 cum
Say 10.209 cum @ Rs 106.37 / cum		Rs 1085.93
3	od226282/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m	

Net Total Quantity		1.000 metre
Say 1.000 metre @ Rs 10859.75 / metre		Rs 10859.75
4	od226285/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m	
Net Total Quantity		1.100 metre
Say 1.100 metre @ Rs 11469.39 / metre		Rs 12616.33
5	od247482/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 4.5m to 6.0m (R1)	
Net Total Quantity		0.700 metre
Say 0.700 metre @ Rs 15442.39 / metre		Rs 10809.67
6	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		144.481 sqm
Say 144.481 sqm @ Rs 249.69 / sqm		Rs 36075.46
7	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		28.530 cum
Say 28.530 cum @ Rs 9413.54 / cum		Rs 268568.30
8	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
Net Total Quantity		4.875 cum

Say 4.875 cum @ Rs 11065.64 / cum		Rs 53944.99
9	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		33.405 cum
Say 33.405 cum @ Rs 82.10 / cum		Rs 2742.55
10	od226292/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		33.405 cum
Say 33.405 cum @ Rs 1916.05 / cum		Rs 64005.65
11	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
Net Total Quantity		1.767 cum
Say 1.767 cum @ Rs 7990.86 / cum		Rs 14119.85
12	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		206.958 kilogram
Say 206.958 kilogram @ Rs 101.29 / kilogram		Rs 20962.78
13	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		2.120 cum
Say 2.120 cum @ Rs 7211.15 / cum		Rs 15287.64
14	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Hard drawn steel wire fabric	
Net Total Quantity		4108.452 kilogram
Say 4108.452 kilogram @ Rs 108.47 / kilogram		Rs 445643.79
15	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On steel work	
Net Total Quantity		205.423 sqm

Say 205.423 sqm @ Rs 223.32 / sqm		Rs 45875.06
16	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		26.706 cum
Say 26.706 cum @ Rs 258.57 / cum		Rs 6905.37
17	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
Net Total Quantity		18.000 each
Say 18.000 each @ Rs 545.00 / each		Rs 9810.00
18	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
Net Total Quantity		17.121 sqm
Say 17.121 sqm @ Rs 45.29 / sqm		Rs 775.41
19	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		965.808 kg
Say 965.808 kg @ Rs 119.79 / kg		Rs 115694.14
20	od247845/2022_2023 Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangement and hand wheel fitted in well. 	
Net Total Quantity		1.000 each
Say 1.000 each @ Rs 248251.00 / each		Rs 248251.00
3 Silt Pit 1.5mx1.5mx1.2m		

1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		12.936 cum
Say 12.936 cum @ Rs 214.03 / cum		Rs 2768.69
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		1.176 cum
Say 1.176 cum @ Rs 106.37 / cum		Rs 125.09
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
Net Total Quantity		1.176 cum
Say 1.176 cum @ Rs 2298.93 / cum		Rs 2703.54
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		0.485 cum
Say 0.485 cum @ Rs 7211.15 / cum		Rs 3497.41
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		3.043 cum
Say 3.043 cum @ Rs 9413.54 / cum		Rs 28645.40
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		3.043 cum
Say 3.043 cum @ Rs 82.10 / cum		Rs 249.83

7	od226292/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		3.043 cum
Say 3.043 cum @ Rs 1916.05 / cum		Rs 5830.54
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		304.300 kilogram
Say 304.300 kilogram @ Rs 98.30 / kilogram		Rs 29912.69
9	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
Net Total Quantity		15.459 sqm
Say 15.459 sqm @ Rs 223.32 / sqm		Rs 3452.30
10	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		21.250 sqm
Say 21.250 sqm @ Rs 249.69 / sqm		Rs 5305.91
11	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		5.533 cum
Say 5.533 cum @ Rs 258.57 / cum		Rs 1430.67
4 Valve chamber 2.3mx3.8mx1.9m		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		45.215 cum
Say 45.215 cum @ Rs 214.03 / cum		Rs 9677.37
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		16.355 cum

Say 16.355 cum @ Rs 106.37 / cum		Rs 1739.68
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
Net Total Quantity		2.886 cum
Say 2.886 cum @ Rs 2298.93 / cum		Rs 6634.71
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		1.584 cum
Say 1.584 cum @ Rs 7211.15 / cum		Rs 11422.46
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		9.835 cum
Say 9.835 cum @ Rs 9413.54 / cum		Rs 92582.17
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		9.835 cum
Say 9.835 cum @ Rs 82.10 / cum		Rs 807.45
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		983.501 kilogram
Say 983.501 kilogram @ Rs 98.30 / kilogram		Rs 96678.15
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		52.481 sqm
Say 52.481 sqm @ Rs 249.69 / sqm		Rs 13103.98

9	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide	
Net Total Quantity		13.800 metre
Say 13.800 metre @ Rs 203.93 / metre		Rs 2814.23
10	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		16.350 cum
Say 16.350 cum @ Rs 258.57 / cum		Rs 4227.62
11	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
Net Total Quantity		6.000 each
Say 6.000 each @ Rs 545.00 / each		Rs 3270.00
5 Pumpsets		
1	od237036/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 20 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years	
Net Total Quantity		2.000 each set
Say 2.000 each set @ Rs 421276.05 / each set		Rs 842552.10

2	od238037/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 5 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years	
Net Total Quantity		2.000 each set
Say 2.000 each set @ Rs 105319.01 / each set		Rs 210638.02
6 Collection Well 3m Dia		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		40.836 cum
Say 40.836 cum @ Rs 214.03 / cum		Rs 8740.13
2	2.26.1 Extra for every additional lift 1.5 m or part thereof in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		10.209 cum
Say 10.209 cum @ Rs 106.37 / cum		Rs 1085.93
3	od237409/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 1.5m to 3m (R1)	
Net Total Quantity		1.000 metre
Say 1.000 metre @ Rs 13800.23 / metre		Rs 13800.23
4	od237410/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 3m to 4.5m (R1)	
Net Total Quantity		0.650 metre
Say 0.650 metre @ Rs 14621.31 / metre		Rs 9503.85

5	od247482/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 4.5m to 6.0m (R1)	
Net Total Quantity		1.400 metre
Say 1.400 metre @ Rs 15442.39 / metre		Rs 21619.35
6	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		95.732 sqm
Say 95.732 sqm @ Rs 249.69 / sqm		Rs 23903.32
7	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		28.637 cum
Say 28.637 cum @ Rs 9413.54 / cum		Rs 269575.54
8	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
Net Total Quantity		4.875 cum
Say 4.875 cum @ Rs 11065.64 / cum		Rs 53944.99
9	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		33.512 cum
Say 33.512 cum @ Rs 82.10 / cum		Rs 2751.34
10	od237411/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	

Net Total Quantity		33.512 cum
Say 33.512 cum @ Rs 1916.05 / cum		Rs 64210.67
11	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
Net Total Quantity		1.767 cum
Say 1.767 cum @ Rs 7990.86 / cum		Rs 14119.85
12	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		206.958 kilogram
Say 206.958 kilogram @ Rs 101.29 / kilogram		Rs 20962.78
13	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		2.804 cum
Say 2.804 cum @ Rs 7211.15 / cum		Rs 20220.06
14	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		4121.838 kilogram
Say 4121.838 kilogram @ Rs 98.30 / kilogram		Rs 405176.68
15	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
Net Total Quantity		209.390 sqm
Say 209.390 sqm @ Rs 223.32 / sqm		Rs 46760.97
16	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		26.706 cum
Say 26.706 cum @ Rs 258.57 / cum		Rs 6905.37

17	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
Net Total Quantity		20.000 each
Say 20.000 each @ Rs 545.00 / each		Rs 10900.00
18	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whitening	
Net Total Quantity		17.121 sqm
Say 17.121 sqm @ Rs 45.29 / sqm		Rs 775.41
19	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		366.349 kg
Say 366.349 kg @ Rs 119.79 / kg		Rs 43884.95
Other Engineering Organisations 7 Odour control arrangements		
1	od250116/2022_2023 Providing Advanced odor control mechanism as directed including supplying, erecting and testing cost of all materials, labour and conveyence charges, hire for tools and equipments etc complte all per the directions of Engineer in charge (For WW3)	
Net Total Quantity		1.000 each
Say 1.000 each @ Rs 1211564.66 / each		Rs 1211564.66
8 Construction of pump room		
1	od248171/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in verified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.	
Net Total Quantity		28.812 sqm
Say 28.812 sam @ Rs 35309.60 / sqm		Rs 1017340.20

9 Cost for generator pedestal and mounting structure with roof sheet		
Lump-Sum Total		Rs 100000.00
10 Construction of Column & Erection of ISMB		
1	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work above plinth level upto floor V level	
Net Total Quantity		0.540 cum
Say 0.540 cum @ Rs 11065.64 / cum		Rs 5975.45
2	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		0.540 cum
Say 0.540 cum @ Rs 82.10 / cum		Rs 44.33
3	od237411/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		0.540 cum
Say 0.540 cum @ Rs 1916.05 / cum		Rs 1034.67
4	5.9.6 Centering and shuttering including strutting, etc. and removal of form for: Columns, Pillars, Piers, Abutments, Posts and Struts	
Net Total Quantity		7.200 sqm
Say 7.200 sqm @ Rs 863.64 / sqm		Rs 6218.21
5	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		54.000 kilogram
Say 54.000 kilogram @ Rs 98.30 / kilogram		Rs 5308.20
6	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On steel work	

Net Total Quantity		10.088 sqm
Say 10.088 sqm @ Rs 223.32 / sqm		Rs 2252.85
7	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
Net Total Quantity		7.380 sqm
Say 7.380 sqm @ Rs 401.21 / sqm		Rs 2960.93
8	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
Net Total Quantity		7.380 sqm
Say 7.380 sqm @ Rs 45.29 / sqm		Rs 334.24
9	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		453.600 kg
Say 453.600 kg @ Rs 119.79 / kg		Rs 54336.74
10	od249219/2022_2023 Charges for chain pulley block with travelling trolley of 2 Tonne capacity	
Net Total Quantity		1.000 each
Say 1.000 each @ Rs 18611.00 / each		Rs 18611.00
Provision for GST payments (in %) @		0.0%
Amount reserved for GST payments		0.00
Total		8809343.00
Lumpsum for round off		657.00
TOTAL Rs 8810000.00		
Rounded Total Rs 88,10,000		
Rupees Eighty Eight Lakh Ten Thousand Only		

(Cost Index Applied for this estimate is 35.59%)

Sewerage Scheme- Construction of wet well 3(Thevara well) (Block7) , Grit /Screen Chamber and connected works at Elamkulam STP

Detailed Estimate

(Dsor year: **2018**, Cost Index Applied for this estimate is **35.59%**)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
1 Wet well 5m dia								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed. All kinds of soil							
	First depth 0 to 1.5m	3.14/4	7.000	7.000	1.500		57.698	
	Second depth 1.5m to 2m	3.14/4	7.000	7.000	0.500		19.233	
	Total Quantity						76.931 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						76.931 cum	
	Say 76.931 cum @ Rs 214.03 / cum						Rs 16465.54	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. All kinds of soil							
	For Earth work 1.5m to 2m	1*3.14/4	7.000	7.000	0.500		19.233	
	Total Quantity						19.233 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						19.233 cum	
	Say 19.233 cum @ Rs 106.37 / cum						Rs 2045.81	
3	od235676/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (For 5m diameter R1)							
		1	1.000				1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 25625.42 / metre						Rs 25625.42	

4	od236568/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (For 5m diameter R1)							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 27040.25 / metre						Rs 40560.38	
5	od236677/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (For 5m diameter R1)							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 28461.85 / metre						Rs 42692.77	
6	od247420/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (For 5m diameter R1)							
		1			0.410		0.410	
	Total Quantity						0.410 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.410 metre	
	Say 0.410 metre @ Rs 29879.56 / metre						Rs 12250.62	
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Upto 1m above and 3m below GL							
	well Kerb - inner	1*3.14	5.000	0.600			9.420	
	well Kerb - outer	1*3.14	6.350	1.330			26.519	
	well Kerb - Slope	3.14	5+5.530		0.900		29.758	
	Side wall	2*3.14	5.600	6.410			225.427	

	Total Quantity						291.124 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						291.124 sqm	
	Say 291.124 sqm @ Rs 249.69 / sqm						Rs 72690.75	
8	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	5.000	5.000	0.600		11.775	
	From 1.5m to 4.5m below ground level-kerb	3.91					3.910	$((.68*.6)+(0.15*(.73)+(0.5*(.68-0.15)*(17.83)))$
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	5.600	0.600	5.410		57.078	
	Total Quantity						72.763 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						72.763 cum	
	Say 72.763 cum @ Rs 9413.54 / cum						Rs 684957.41	
9	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	3.14	5.600	0.600	1.000		10.551	
	Total Quantity						10.551 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						10.551 cum	

	Say 10.551 cum @ Rs 11065.64 / cum						Rs 116753.57	
10	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	5.000	5.000	0.600		11.775	
	From 1.5m to 4.5m below ground level-kerb	3.91					3.910	((.68*.6)+(0.15*(.73)+(0.5*(.68-0.15)*(0.73)*17.83))
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	5.600	0.600	5.410		57.078	
	Side wall	3.14	5.600	0.600	1.000		10.551	
	Total Quantity						83.314 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						83.314 cum	
	Say 83.314 cum @ Rs 82.10 / cum						Rs 6840.08	
11	od226292/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	5.000	5.000	0.600		11.775	
	From 1.5m to 4.5m below ground level-kerb	3.91					3.910	((.68*.6)+(0.15*(.73)+(0.5*(.68-0.15)*(0.73)*17.83))
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	5.600	0.600	5.410		57.078	
	Side wall	3.14	5.600	0.600	1.000		10.551	
	Total Quantity						83.314 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						83.314 cum	

	Say 83.314 cum @ Rs 1916.05 / cum						Rs 159633.79	
12	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	Benching	3.14/4	5.000	5.000	0.250		4.907	
	Total Quantity						4.907 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						4.907 cum	
	Say 4.907 cum @ Rs 7990.86 / cum						Rs 39211.15	
13	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	6.200	16.900			329.010	
	Total Quantity						329.010 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						329.010 kilogram	
	Say 329.010 kilogram @ Rs 101.29 / kilogram						Rs 33325.42	
14	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging bottom	3.14/4	5.600	5.600	0.400		9.848	
	Total Quantity						9.848 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						9.848 cum	
	Say 9.848 cum @ Rs 7211.15 / cum						Rs 71015.41	
15	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	From 4.5m to 9.0m below ground leve-bottom slabl	3.14/4	5.000	5.000	0.600	120.0	1413.000	

	From 1.5m to 4.5m below ground level-kerb	3.91				120.0	469.201	$((.68*.6)+(0.15*(.73)+(0.5*(.68-0.15)*(0.73)*17.83))$
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	5.600	0.600	5.410	120.0	6849.320	
	Side wall	3.14	5.600	0.600	1.000	120.0	1266.048	
	wastage at 2.5%	1	10002.010		2.5/100		250.051	
	Total Quantity						10247.620 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						10247.620 kilogram	
	Say 10247.620 kilogram @ Rs 98.30 / kilogram						Rs 1007341.05	
16	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On steel work							
		10247.620				0.05	512.382	0.0508 m2/kg
	Total Quantity						512.382 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						512.382 sqm	
	Say 512.382 sqm @ Rs 223.32 / sqm						Rs 114425.15	
17	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total volume of the well	1*3.14/4	5.000	5.000	2.000		-39.250	
	First depth 0 to 1.5m	3.14/4	7.000	7.000	1.500		57.698	
	Second depth 1.5m to 2m	3.14/4	7.000	7.000	0.500		19.233	
	Total Quantity						76.931 cum	
	Total Deducted Quantity						-39.250 cum	
	Net Total Quantity						37.681 cum	
	Say 37.681 cum @ Rs 258.57 / cum						Rs 9743.18	

18	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		22					22.000	
	Total Quantity						22.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						22.000 each	
	Say 22.000 each @ Rs 545.00 / each						Rs 11990.00	
19	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	Well outer 1m above GL)	1*3.14	6.200	1.000			19.468	
	top of wall thickness	1*3.14	5.600	0.600			10.551	
	Total Quantity						30.019 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						30.019 sqm	
	Say 30.019 sqm @ Rs 45.29 / sqm						Rs 1359.56	
20	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Area of pumping station(31 sqm)							
	(33*0.58)+(17*0.28)=24.23 kg/m	1	31.000			24.23	751.130	25 x 3 flats at 30 mm spacing=3 3nos@0.5 9,12 x 3 flats at 60 mm spacing=1 7@.28

	25 x6 SS for outer frame@1.18kg/m	1*3.14	6.200				1.18	22.973	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	6.200				3.92	48.608	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	5.600				4.47	25.032	
	Misc. items for opening frame	1	10.000					10.000	
Total Quantity								857.743 kg	
Total Deducted Quantity								0.000 kg	
Net Total Quantity								857.743 kg	
Say 857.743 kg @ Rs 119.79 / kg								Rs 102749.03	
Sl No	Description	No	L	B	D	CF	Quantity	Remark	
2 Grit/Screen Chamber 3m dia									
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m disposed earth to be levelled and neatly dressed.All kinds of soil								
	For 0 to 1.5 m	1*3.14/4	5.100	5.100	1.500		30.627		
	For 1.5m to 2 m	1*3.14/4	5.100	5.100	0.500		10.209		
Total Quantity								40.836 cum	
Total Deducted Quantity								0.000 cum	
Net Total Quantity								40.836 cum	
Say 40.836 cum @ Rs 214.03 / cum								Rs 8740.13	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil								
	For 1.5m to 2m	1*3.14/4	5.100	5.100	0.500		10.209		
Total Quantity								10.209 cum	
Total Deducted Quantity								0.000 cum	
Net Total Quantity								10.209 cum	
Say 10.209 cum @ Rs 106.37 / cum								Rs 1085.93	
3	od226282/2022_2023								

	Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m							
		1	1.000				1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 10859.75 / metre						Rs 10859.75	
4	od226285/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m							
		1	1.100				1.100	
	Total Quantity						1.100 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.100 metre	
	Say 1.100 metre @ Rs 11469.39 / metre						Rs 12616.33	
5	od247482/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 4.5m to 6.0m (R1)							
		1			0.700		0.700	
	Total Quantity						0.700 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.700 metre	
	Say 0.700 metre @ Rs 15442.39 / metre						Rs 10809.67	
6	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Well kerb inner	1*3.14	3.000	0.450			4.240	
	Well kerb outer	1*3.14	4.050	1.050			13.353	
	Well kerb Slope	1*3.14	3.000+3.3 8		0.710		14.224	
	Side wall	2*3.14	3.450	5.200			112.664	
	Total Quantity						144.481 sqm	

Total Deducted Quantity							0.000 sqm
Net Total Quantity							144.481 sqm
Say 144.481 sqm @ Rs 249.69 / sqm							Rs 36075.46
7	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work upto plinth level						
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180
	Well kerb	1	11.070	0.525	0.450		2.616
		1	11.070	0.150	0.600		0.997
		1*5	11.070	.53-.15	0.600		1.262
	Side Wall	3.14	3.450	0.450	4.200		20.475
	Total Quantity						28.530 cum
	Total Deducted Quantity						0.000 cum
	Net Total Quantity						28.530 cum
	Say 28.530 cum @ Rs 9413.54 / cum						Rs 268568.30
8	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work above plinth level upto floor V level						
	Side wall	1*3.14	3.450	0.450	1.000		4.875
	Total Quantity						4.875 cum

Total Deducted Quantity							0.000 cum
Net Total Quantity							4.875 cum
Say 4.875 cum @ Rs 11065.64 / cum							Rs 53944.99
9	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).						
	Side wall	1*3.14	3.450	0.450	1.000		4.875
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180
	Well kerb	1	11.070	0.525	0.450		2.616
		1	11.070	0.150	0.600		0.997
		1*5	11.070	.53-.15	0.600		1.262
	Side Wall	3.14	3.450	0.450	4.200		20.475
Total Quantity							33.405 cum
Total Deducted Quantity							0.000 cum
Net Total Quantity							33.405 cum
Say 33.405 cum @ Rs 82.10 / cum							Rs 2742.55
10	od226292/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.						
	Side wall	1*3.14	3.450	0.450	1.000		4.875
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180
	Well kerb	1	11.070	0.525	0.450		2.616
		1	11.070	0.150	0.600		0.997
		1*5	11.070	.53-.15	0.600		1.262

	Side Wall	3.14	3.450	0.450	4.200		20.475	Circum=3.14*3.53=11.07
	Total Quantity						33.405 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						33.405 cum	
	Say 33.405 cum @ Rs 1916.05 / cum						Rs 64005.65	
11	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	Benching	1*3.14/4	3.000	3.000	0.250		1.767	
	Total Quantity						1.767 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.767 cum	
	Say 1.767 cum @ Rs 7990.86 / cum						Rs 14119.85	
12	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	3.900	16.900			206.958	
	Total Quantity						206.958 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						206.958 kilogram	
	Say 206.958 kilogram @ Rs 101.29 / kilogram						Rs 20962.78	
13	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging the bottom of the well	1*3.14/4	3.000	3.000	0.300		2.120	
	Total Quantity						2.120 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.120 cum	
	Say 2.120 cum @ Rs 7211.15 / cum						Rs 15287.64	

14	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric								
	Side wall@120kg/m3 of concrete	1*3.14	3.450	0.450	1.000	120.0	584.983		
	B o t t o m slab@120kg/m3 of concrete	1*3.14	1.500	1.500	0.450	120.0	381.510		
	Well kerb@120kg/m3 of concrete	1	11.070	0.525	0.450	120.0	313.835	Circum=3.14*3.53=11.07	
	@ 120 kg / m 3 of concrete	1	11.070	0.150	0.600	120.0	119.556	Circum=3.14*3.53=11.07	
	@ 120 kg / m 3 of concrete	1*5	11.070	.53-.15	0.600	120.0	151.438	Circum=3.14*3.53=11.07	
	Side Wall@120kg/m3 of concrete	3.14	3.450	0.450	4.200	120.0	2456.925	Circum=3.14*3.53=11.07	
	2.5% wastage	4008.20			2.5/100		100.205		
Total Quantity							4108.452 kilogram		
Total Deducted Quantity							0.000 kilogram		
Net Total Quantity							4108.452 kilogram		
Say 4108.452 kilogram @ Rs 108.47 / kilogram							Rs 445643.79		
15	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work								
		1	4108.452			0.05	205.423		
Total Quantity							205.423 sqm		
Total Deducted Quantity							0.000 sqm		
Net Total Quantity							205.423 sqm		
Say 205.423 sqm @ Rs 223.32 / sqm							Rs 45875.06		
16	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.								

	Earthwork Qty as per item 1	1	40.8360				40.836	
	Volume of well	1*3.14/4	3.000	3.000	2.000		-14.130	
	Total Quantity						40.836 cum	
	Total Deducted Quantity						-14.130 cum	
	Net Total Quantity						26.706 cum	
	Say 26.706 cum @ Rs 258.57 / cum						Rs 6905.37	
17	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		18					18.000	
	Total Quantity						18.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						18.000 each	
	Say 18.000 each @ Rs 545.00 / each						Rs 9810.00	
18	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	Well outer	1	3.140	3.900	1.000		12.246	
	Wall top	1	3.140	3.450	0.450		4.875	
	Total Quantity						17.121 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						17.121 sqm	
	Say 17.121 sqm @ Rs 45.29 / sqm						Rs 775.41	
19	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Area of slant screen(3*1.7)=5.1sqm							

	weight of 29 nos 50mmx10mm flats at 3 5 m m spacing@3.92k/m	29	5.100			3.92	579.768	
	50 x 10mm SS for o u t e r frame @3.92Kg/m	1	(3+1.7)*2			3.92	36.848	
	Area of pumping station 12sqm							
	25 x 3 flats at 30 mm spacing@.58kg/m	33	12.000			0.59	233.640	
	12 x 3 flats at 60 mm spacing	17	12.000			0.28	57.121	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.900			3.92	30.576	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	1.880			4.47	8.404	
	Misc. items for opening frame	1	5.000				5.000	
	25 x6 SS for outer frame	3.14	3.900			1.18	14.451	@1.18kg/ m
	Total Quantity						965.808 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						965.808 kg	
	Say 965.808 kg @ Rs 119.79 / kg						Rs 115694.14	
20	od247845/2022_2023 Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangment and hand wheel fitted in well. 							
		1					1.000	
	Total Quantity						1.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						1.000 each	
	Say 1.000 each @ Rs 248251.00 / each						Rs 248251.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
3 Silt Pit 1.5mx1.5mx1.2m								

1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	2.800	2.800	1.650		12.936	
	Total Quantity						12.936 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						12.936 cum	
	Say 12.936 cum @ Rs 214.03 / cum						Rs 2768.69	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
		1	2.800	2.800	0.150		1.176	
	Total Quantity						1.176 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.176 cum	
	Say 1.176 cum @ Rs 106.37 / cum						Rs 125.09	
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	2.800	2.800	0.150		1.176	
	Total Quantity						1.176 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.176 cum	
	Say 1.176 cum @ Rs 2298.93 / cum						Rs 2703.54	
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	2.200	2.200	0.100		0.485	
	Total Quantity						0.485 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.485 cum	
	Say 0.485 cum @ Rs 7211.15 / cum						Rs 3497.41	
5	5.33.1							

	Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 9413.54 / cum						Rs 28645.40	
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 82.10 / cum						Rs 249.83	
7	od226292/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	

	Say 3.043 cum @ Rs 1916.05 / cum						Rs 5830.54	
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	100Kg/m3 of concrete	1	3.043	100.000			304.300	
	Total Quantity						304.300 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						304.300 kilogram	
	Say 304.300 kilogram @ Rs 98.30 / kilogram						Rs 29912.69	
9	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
	@0.0508sqm/kg	304.300				0.05	15.459	
	Total Quantity						15.459 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						15.459 sqm	
	Say 15.459 sqm @ Rs 223.32 / sqm						Rs 3452.30	
10	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Base slab side	4	2.000		0.200		1.600	
	Inner side	4	1.500		1.200		7.200	
	Outer side	4	2.000		1.200		9.600	
	Baffle wall	2	1.500		0.950		2.850	
	Total Quantity						21.250 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						21.250 sqm	
	Say 21.250 sqm @ Rs 249.69 / sqm						Rs 5305.91	
11	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total Excavation Item 1	1	12.936				12.936	
	Sand filling item 2	1	1.176				-1.176	
	PCC item3	1	0.485				-0.485	

	RCC item5	1	3.043				-3.043	
	Pit size	1	1.500	1.500	1.200		-2.699	
	Total Quantity						12.936 cum	
	Total Deducted Quantity						-7.403 cum	
	Net Total Quantity						5.533 cum	
	Say 5.533 cum @ Rs 258.57 / cum						Rs 1430.67	
Sl No	Description	No	L	B	D	CF	Quantity	Remark
4 Valve chamber 2.3mx3.8mx1.9m								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	3.700	5.200	2.350		45.215	
	Total Quantity						45.215 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						45.215 cum	
	Say 45.215 cum @ Rs 214.03 / cum						Rs 9677.37	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
		1	3.700	5.200	0.850		16.355	
	Total Quantity						16.355 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						16.355 cum	
	Say 16.355 cum @ Rs 106.37 / cum						Rs 1739.68	
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	3.700	5.200	0.150		2.886	
	Total Quantity						2.886 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.886 cum	
	Say 2.886 cum @ Rs 2298.93 / cum						Rs 6634.71	
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and							

	shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	3.300	4.800	0.100		1.584	
	Total Quantity						1.584 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.584 cum	
	Say 1.584 cum @ Rs 7211.15 / cum						Rs 11422.46	
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Raft	1	3.100	4.600	0.200		2.853	
	Walls	2	2.700	0.200	1.900		2.052	
		2	3.800	0.200	1.900		2.888	
	slab	1	2.700	4.200	0.180		2.042	
	Total Quantity						9.835 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						9.835 cum	
	Say 9.835 cum @ Rs 9413.54 / cum						Rs 92582.17	
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Raft	1	3.100	4.600	0.200		2.853	
	Walls	2	2.700	0.200	1.900		2.052	
		2	3.800	0.200	1.900		2.888	
	slab	1	2.700	4.200	0.180		2.042	
	Total Quantity						9.835 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						9.835 cum	
	Say 9.835 cum @ Rs 82.10 / cum						Rs 807.45	
7	5.22.6							

	Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	@ 100kg per m3 concrete	1	9.835	100.000			983.501	
	Total Quantity						983.501 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						983.501 kilogram	
	Say 983.501 kilogram @ Rs 98.30 / kilogram						Rs 96678.15	
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Raft	2	3.100		0.200		1.241	
		2		4.600	0.200		1.840	
	Walls outer	2	2.700		1.900		10.260	
		2		4.200	1.900		15.960	
	Walls inner	2	2.300		1.900		8.740	
		2		3.800	1.900		14.440	
	Total Quantity						52.481 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						52.481 sqm	
	Say 52.481 sqm @ Rs 249.69 / sqm						Rs 13103.98	
9	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide							
	Cover slab	2	2.7+4.2				13.800	
	Total Quantity						13.800 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						13.800 metre	
	Say 13.800 metre @ Rs 203.93 / metre						Rs 2814.23	
10	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total excavated earth Item 1	1	45.215				45.215	
	Sand filling Item 2	1	2.890				-2.890	

	PCC item 3	1	1.580				-1.580	
	RCC item 4	1	7.790				-7.790	
	Chamber size	1	2.300	3.800	1.900		-16.605	
	Total Quantity						45.215 cum	
	Total Deducted Quantity						-28.865 cum	
	Net Total Quantity						16.350 cum	
	Say 16.350 cum @ Rs 258.57 / cum						Rs 4227.62	
11	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		6					6.000	
	Total Quantity						6.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						6.000 each	
	Say 6.000 each @ Rs 545.00 / each						Rs 3270.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
5 Pumpsets								
1	od237036/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 20 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years							
		2					2.000	
	Total Quantity						2.000 each set	
	Total Deducted Quantity						0.000 each set	
	Net Total Quantity						2.000 each set	
	Say 2.000 each set @ Rs 421276.05 / each set						Rs 842552.10	

2	od238037/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 5 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years							
		2					2.000	
	Total Quantity						2.000 each set	
	Total Deducted Quantity						0.000 each set	
	Net Total Quantity						2.000 each set	
	Say 2.000 each set @ Rs 105319.01 / each set						Rs 210638.02	
SI No	Description	No	L	B	D	CF	Quantity	Remark
6 Collection Well 3m Dia								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		3.14/4	5.100	5.100	2.000		40.836	
	Total Quantity						40.836 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						40.836 cum	
	Say 40.836 cum @ Rs 214.03 / cum						Rs 8740.13	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
		3.14/4	5.100	5.100	0.500		10.209	
	Total Quantity						10.209 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						10.209 cum	
	Say 10.209 cum @ Rs 106.37 / cum						Rs 1085.93	
3	od237409/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances							

	including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 1.5m to 3m (R1)							
		1	1.000				1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 13800.23 / metre						Rs 13800.23	
4	od237410/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 3m to 4.5m (R1)							
		1	0.650				0.650	
	Total Quantity						0.650 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.650 metre	
	Say 0.650 metre @ Rs 14621.31 / metre						Rs 9503.85	
5	od247482/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 4.5m to 6.0m (R1)							
		1			1.400		1.400	
	Total Quantity						1.400 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.400 metre	
	Say 1.400 metre @ Rs 15442.39 / metre						Rs 21619.35	
6	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	well Kerb - inner	3.14	3.000	0.450			4.240	
	well Kerb - outer	3.14	4.050	1.050			13.353	
	well Kerb - slope	3.14	3.000+3.38		0.710		14.224	
	Side wall	3.14	3.450	5.900			63.915	
	Total Quantity						95.732 sqm	
	Total Deducted Quantity						0.000 sqm	

	Net Total Quantity						95.732 sqm	
	Say 95.732 sqm @ Rs 249.69 / sqm						Rs 23903.32	
7	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Side wall	3.14	3.450	0.450	4.900		23.887	
	kerb	1.57					1.570	((.53*.45)+(.15*(.6)+(0.5*(.53-.15)*(1.07))))
	Bottom Slab	3.14/4	3.000	3.000	0.450		3.180	
	Total Quantity						28.637 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						28.637 cum	
	Say 28.637 cum @ Rs 9413.54 / cum						Rs 269575.54	
8	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	3.14	3.450	0.450	1.000		4.875	
	Total Quantity						4.875 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						4.875 cum	
	Say 4.875 cum @ Rs 11065.64 / cum						Rs 53944.99	
9	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							

	Side wall	3.14	3.450	0.450	4.900		23.887	
	kerb	1.57					1.570	$((.53*.45)+(.15*(.6)+(0.5*(.53-.15)*(6)*11.07)))$
	Bottom Slab	3.14/4	3.000	3.000	0.450		3.180	
	Side wall	3.14	3.450	0.450	1.000		4.875	
	Total Quantity						33.512 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						33.512 cum	
	Say 33.512 cum @ Rs 82.10 / cum						Rs 2751.34	
10	od237411/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Side wall	3.14	3.450	0.450	4.900		23.887	
	kerb	1.57					1.570	$((.53*.45)+(.15*(.6)+(0.5*(.53-.15)*(6)*11.07)))$
	Bottom Slab	3.14/4	3.000	3.000	0.450		3.180	
	Side wall	3.14	3.450	0.450	1.000		4.875	
	Total Quantity						33.512 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						33.512 cum	
	Say 33.512 cum @ Rs 1916.05 / cum						Rs 64210.67	
11	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	Benching	3.14/4	3.000	3.000	0.250		1.767	
	Total Quantity						1.767 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.767 cum	
	Say 1.767 cum @ Rs 7990.86 / cum						Rs 14119.85	
12	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting,							

	fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	3.14	3.900		16.900		206.958	
	Total Quantity						206.958 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						206.958 kilogram	
	Say 206.958 kilogram @ Rs 101.29 / kilogram						Rs 20962.78	
13	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging the bottom	3.14/4	3.450	3.450	0.300		2.804	
	Total Quantity						2.804 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.804 cum	
	Say 2.804 cum @ Rs 7211.15 / cum						Rs 20220.06	
14	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	Side wall	3.14	3.450	0.450	4.900	120.0	2866.412	
	kerb	1.57				120.0	188.400	((.53*.45)+(.15*(.6)+(0.5*(.53-.15)*(6)*1.07)))
	Bottom Slab	3.14/4	3.000	3.000	0.450	120.0	381.510	
	Side wall	3.14	3.450	0.450	1.000	120.0	584.983	
	wastage at 2.5%	1	4021.305		2.5/100		100.533	
	Total Quantity						4121.838 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						4121.838 kilogram	
	Say 4121.838 kilogram @ Rs 98.30 / kilogram						Rs 405176.68	
15	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On							

	steel work							
		4121.838				0.05	209.390	
	Total Quantity						209.390 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						209.390 sqm	
	Say 209.390 sqm @ Rs 223.32 / sqm						Rs 46760.97	
16	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	earth work quantity	1	40.836				40.836	
	Total volume of the well	3.14/4	3.000	3.000	2.000		-14.130	
	Total Quantity						40.836 cum	
	Total Deducted Quantity						-14.130 cum	
	Net Total Quantity						26.706 cum	
	Say 26.706 cum @ Rs 258.57 / cum						Rs 6905.37	
17	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		20					20.000	
	Total Quantity						20.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						20.000 each	
	Say 20.000 each @ Rs 545.00 / each						Rs 10900.00	
18	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	well outer	1	3.140	3.900	1.000		12.246	
	top of wall thickness	1	3.140	3.450	0.450		4.875	
	Total Quantity						17.121 sqm	

	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						17.121 sqm	
	Say 17.121 sqm @ Rs 45.29 / sqm						Rs 775.41	
19	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Area of pumping station(12							
	(33*0.58)+(17*0.28)=24.23 4.23 kg/m	1	12.000			24.23	290.760	25 x 3 flats at 30 mm spacing=3 nos@0.5 9,12 x 3 flats at 60 mm spacing=17@.28
	25 x6 SS for outer frame@1.18kg/m	1*3.14	3.900			1.18	14.451	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.900			3.92	30.576	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	4.600			4.47	20.562	
	Misc. items for opening frame	1	10.000				10.000	
	Total Quantity						366.349 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						366.349 kg	
	Say 366.349 kg @ Rs 119.79 / kg						Rs 43884.95	
SI No	Description	No	L	B	D	CF	Quantity	Remark
7 Odour control arrangements								
1	od250116/2022_2023 Providing Advanced odor control mechanism as directed including supplying, erecting and testing cost of all materials, labour and conveyence charges, hire for tools and equipments etc complte all per the directions of Engineer in charge (For WW3)							
		1					1.000	

Total Quantity							1.000 each	
Total Deducted Quantity							0.000 each	
Net Total Quantity							1.000 each	
Say 1.000 each @ Rs 1211564.66 / each							Rs 1211564.66	
SI No	Description	No	L	B	D	CF	Quantity	Remark
8 Construction of pump room								
1	od248171/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in column and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in verified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty. The sanitary/Plumping and Electrical works are followed by standard specifications.							
		1	6.460	4.460			28.812	
Total Quantity							28.812 sqm	
Total Deducted Quantity							0.000 sqm	
Net Total Quantity							28.812 sqm	
Say 28.812 sqm @ Rs 35309.60 / sqm							Rs 1017340.20	
SI No	Description	No	L	B	D	CF	Quantity	Remark
9 Cost for generator pedestal and mounting structure with roof sheet								
Lump-Sum Total							Rs 100000.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
Remark	10 Construction of Column & Erection of ISMB							
1	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work above plinth level upto floor V level							
	Upto 1.5m from G.L	2	0.300	0.300	0.500		0.090	
	above 1.5m from G.L for column	2	0.300	0.300	2.500		0.450	
Total Quantity							0.540 cum	
Total Deducted Quantity							0.000 cum	

	Net Total Quantity						0.540 cum	
	Say 0.540 cum @ Rs 11065.64 / cum						Rs 5975.45	
2	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Upto 1.5m from G.L	2	0.300	0.300	0.500		0.090	
	above 1.5m from G.L for column	2	0.300	0.300	2.500		0.450	
	Total Quantity						0.540 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.540 cum	
	Say 0.540 cum @ Rs 82.10 / cum						Rs 44.33	
3	od237411/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Upto 1.5m from G.L	2	0.300	0.300	0.500		0.090	
	above 1.5m from G.L for column	2	0.300	0.300	2.500		0.450	
	Total Quantity						0.540 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.540 cum	
	Say 0.540 cum @ Rs 1916.05 / cum						Rs 1034.67	
4	5.9.6 Centering and shuttering including strutting, etc. and removal of form for: Columns, Pillars, Piers, Abutments, Posts and Struts							
	upto 3.0m from G.L for column	8	0.300		2.000		4.800	
	above 3.0 m to 4.0 m	8	0.300		1.000		2.400	
	Total Quantity						7.200 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						7.200 sqm	
	Say 7.200 sqm @ Rs 863.64 / sqm						Rs 6218.21	
5	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more							
		1	0.540	100.000			54.000	

	Total Quantity							54.000 kilogram
	Total Deducted Quantity							0.000 kilogram
	Net Total Quantity							54.000 kilogram
	Say 54.000 kilogram @ Rs 98.30 / kilogram							Rs 5308.20
6	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On steel work							
		1	54.000	0.0508			2.744	
		1	7.200		0.600		4.320	
		2	7.200	0.210			3.024	
	Total Quantity							10.088 sqm
	Total Deducted Quantity							0.000 sqm
	Net Total Quantity							10.088 sqm
	Say 10.088 sqm @ Rs 223.32 / sqm							Rs 2252.85
7	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Side	8	0.300		3.000		7.200	
		2	0.300	0.300			0.180	
	Total Quantity							7.380 sqm
	Total Deducted Quantity							0.000 sqm
	Net Total Quantity							7.380 sqm
	Say 7.380 sqm @ Rs 401.21 / sqm							Rs 2960.93
8	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	Side	8	0.300		3.000		7.200	
		2	0.300	0.300			0.180	
	Total Quantity							7.380 sqm
	Total Deducted Quantity							0.000 sqm
	Net Total Quantity							7.380 sqm
	Say 7.380 sqm @ Rs 45.29 / sqm							Rs 334.24
9	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							

	Supply and fixing ISHB 300mm of 63kg/m for 7.2m on column over suction well	1	63.000	7.200			453.600	
	Total Quantity						453.600 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						453.600 kg	
	Say 453.600 kg @ Rs 119.79 / kg						Rs 54336.74	
10	od249219/2022_2023 Charges for chain pulley block with travelling trolley of 2 Tonne capacity							
		1					1.000	
	Total Quantity						1.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						1.000 each	
	Say 1.000 each @ Rs 18611.00 / each						Rs 18611.00	
Provision for GST payments (in %) @					0.0%			
Amount reserved for GST payments					0.00			
Total					8809343.00			
Lumpsum for round off					657.00			
					TOTAL Rs 8810000.00			
					Rounded Total Rs 88,10,000			
Rupees Eighty Eight Lakh Ten Thousand Only								

(Cost Index Applied for this estimate is 35.59%)

Data Analysis

Wet well 5m dia					
1 Specification Code: 2.6.1					

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89
TOTAL					1578.52
Cost of 10.0 cum					1578.52
Cost per cum					157.85
Say					157.85

	Cost index	35.59 %			56.18
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	Total with Cost index				214.03
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2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
TOTAL					675.50
Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

	Cost index 35.59 %				27.92
	Total with Cost index				106.37

3 Specification Code: od235676/2022_2023

od235676/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (For 5m diameter R1)

Quantity for 3.0m depth=3.14*3.1*3.1*3=90.53m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPOH) 100.3.5.2 328.41*1.3559	cum	90.53000	445.29	40312.10
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	90.53000	276.83	25061.42
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					65973.52
	cost for 3.0 metre				65973.52
	cost for one metre				21991.17
	say				21991.17

	Add Water Charges @ 1.0%				219.91
	Add CPOH @ 15.0%				3331.66
	Cost index 35.59 %				82.67
	Total with Cost index				25625.42
	Say				25625.42

4 Specification Code: od236568/2022_2023

od236568/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (For 5m diameter R1)

Quantity for 3.0m depth=3.14*3.1*3.1*3=90.52m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.3 358.24*1.3559 =485.74	cum	90.52000	485.74	43969.18
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	90.52000	276.83	25058.65
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					69627.83
	cost for 3.0 metre				69627.83
	cost for one metre				23209.28
	say				23209.28

	Add Water Charges @ 1.0%				232.09
	Add CPOH @ 15.0%				3516.20
	Cost index 35.59 %				82.67
	Total with Cost index				27040.25
	Say				27040.25

5 Specification Code: od236677/2022_2023

od236677/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (For 5m diameter R1)

Quantity for 3.0m depth=3.14*3.1*3.1*3=90.5264m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.4 388.12*1.3559 =485.74	cum	90.52600	526.25	47639.31
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	90.52600	276.83	25060.31
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					73299.62
	cost for 3.0 metre				73299.62
	cost for one metre				24433.21
	say				24433.21

	Add Water Charges @ 1.0%				244.33
	Add CPOH @ 15.0%				3701.63
	Cost index 35.59 %				82.67
	Total with Cost index				28461.85
	Say				28461.85

6 Specification Code: od247420/2022_2023

od247420/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (For 5m diameter R1)

Quantity for 3.0m depth=3.14*3.1*3.1*3=90.526m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.5 417.95*1.3559 =566.70	cum	90.52600	566.70	51301.08
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	90.52600	276.83	25060.31
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					76961.39
	cost for 3.0 metre				76961.39
	cost for one metre				25653.80
	say				25653.80

	Add Water Charges @ 1.0%				256.53
	Add CPOH @ 15.0%				3886.55
	Cost index 35.59 %				82.67
	Total with Cost index				29879.56
	Say				29879.56

7 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	<p>Details of cost for 26.39 sqm</p> <p>Surface area</p> <p>Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm</p> <p>MATERIAL:</p> <p>Assuming that the timber will become unserviceable after being used 8 times</p> <p>planks 38 mm (Second class kail wood</p> <p>$26.39 \times 0.038 = 1.00$ cum</p> <p>Wastage 2% = 0.20 cum.</p> <p>Total = 1.20 cum . or 1200 cudm.</p> <p>Qty for cost using once = $1200/8 = 150$ cudm</p>				
1198	<p>Second class kail wood in planks</p> <p>2nd class kail wood battens</p> <p>Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712$ cum</p> <p>Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798$ cum</p> <p>Total = 0.1510 cum.</p> <p>Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm</p> <p>Qty for cost using once = $0.1586/8 = 0.0198$ cum</p>	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = $53/8 = 6.625$ m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material $(P+Q+R)/6 = (3750.00+0.50+245.12/6)$	metre	6.625	40.00	265.00(R)
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Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations

Cost index	35.59 %	65.54
Total with Cost index		249.69

8 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1

All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00
TOTAL					5977.32

Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

Cost index 35.59 %	2470.89
Total with Cost index	9413.54

9 Specification Code: 5.33.2

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2

All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20

0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level $0.75 \times 2.5 = 1.88$	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL	7026.36
Add Water Charges @ 1%	70.26
TOTAL	7096.62
Add CPOH @ 15%	1064.49
TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

	Cost index 35.59 %				2904.54
	Total with Cost index				11065.64

10 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

11 Specification Code: od226292/2022_2023

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od226292/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

12 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				

0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

TOTAL				5073.95
Add Water Charges @ 1%				50.74
TOTAL				5124.69
Add CPOH @ 15%				768.70
TOTAL				5893.39
Cost of 1.0 cum				5893.39
Say				5893.4

Cost index		35.59 %			2097.46
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	Total with Cost index				7990.86
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13 Specification Code: 10.1

SUBHEAD : 10.0

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				
1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34
AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)					63.17
TOTAL					6512.45

AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)	957.07
TOTAL	7470.00
Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

Cost index	35.59 %				26.59
Total with Cost index					101.29

14 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31

2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL				4578.85
Add Water Charges @ 1%				45.79
TOTAL				4624.64
Add CPOH @ 15%				693.70
TOTAL				5318.34
Cost of 1.0 cum				5318.34
Say				5318.35

Cost index 35.59 %					1892.80
Total with Cost index					7211.15

15 Specification Code: 5.22.6

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6

Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
TOTAL					6241.51
Add Water Charges @ 1%					62.42
TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52
Cost per kilogram					72.50
Say					72.5

	Cost index 35.59 %				25.80
	Total with Cost index				98.30

16 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and

applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25
Cost of 10.0 sqm					1647.25

Cost per sqm	164.72
Say	164.7

Cost index 35.59 %	58.62
Total with Cost index	223.32

17 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95
Cost per cum					190.69
Say					190.7

Cost index 35.59 %	67.87
Total with Cost index	258.57

18 Specification Code: 19.16

SUBHEAD : 19.0**DRAINAGE****19.16**

Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foot rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number 4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) 1st class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
Add Water Charges @ 1% except on A ie on (354.8-62.7=292.1)					2.92

TOTAL	357.72
AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)	44.25
TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

Cost index 35.59 %	143.05
Total with Cost index	545.00

19 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whitening

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46
TOTAL					287.76

Add Water Charges @ 1%	2.88
TOTAL	290.64
Add CPOH @ 15%	43.60
TOTAL	334.24
Cost of 10.0 sqm	334.24
Cost per sqm	33.42
Say	33.4

Cost index 35.59 %	11.89
Total with Cost index	45.29

20 Specification Code: 10.2

SUBHEAD : 10.0

STEEL WORK

10.2

Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				

1007	<p>Structural steel such as tees, angles, channels and R.S. joists</p> <p>(ii) Tiles (flats) 50x12mm: $2 \times 2.7 = 5.4 \text{ m @ } 4.7 \text{ kg/m} = 25.38\text{kg}+$</p> <p>Ties central (flats): $50 \times 10\text{mm } 1 \times 2.80 = 2.8 \text{ m @ } 3.90 \text{ kg/m} = 10.92\text{kg}+$</p> <p>Braces (flats) 40x 10 mm: $2 \times 1.84 = 3.68\text{m @ } 3.9 \text{ kg/m} = 14.35 \text{ kg.}$</p> <p>Total = 50.65 kg+</p> <p>Add wastage @ 5% = 2.53kg</p> <p>Total = 53.18kg. = 0.53 qtl</p>	quintal	1.6	4600.00	7360.00
1009	<p>Flats exceeding 10 mm in thickness</p> <p>(iii) Gusset plates 10 mm thick: $1 \times 0.74 \times 0.35\text{m} = 0.259 \text{ sqm.}+$</p> <p>Shone $4 \times 0.46 \times 0.46 = 0.845 \text{ sqm.}$</p> <p>Total = 1.104 sqm.</p> <p>$1.104 \text{ sqm @ } 78.4 \text{ kg/m} = 86.55 \text{ kg}$</p> <p>12 mm plates at the point of principal rafter and strut: $2 \times 0.3 \times 0.2 = 0.12 \text{ sqm.} +$</p> <p>Tie beam, brace and strut: $2 \times 0.5 \times 0.3 = 0.30 \text{ sqm.} +$</p> <p>Sole plates: $2 \times 0.46 \times 0.46 = 0.42 \text{ sqm.}+$</p> <p>Anchor plate: $2 \times 0.46 \times 0.1 = 0.09\text{sqm.}$</p> <p>Total = 0.93 sqm. Say 1.00 sqm.</p> <p>$1.00 \text{ sqm. @ } 94.4 \text{ kg/m} = 94.40 \text{ kg.}$</p> <p>Total = 180.95 kg</p> <p>Add wastage @ 5% = 9.05 kg.</p> <p>Total = 190.00kg or 1.90 q</p>	quintal	0.53	4600.00	2438.00
1010	<p>Mild steel plates</p> <p>(iv) 16mm dia. 50 mm long rivets = 56 Nos.+</p> <p>Add wastage @ 5 % = 2.8 Nos.</p> <p>Total = 58.8 Nos.</p>	quintal	1.9	4800.00	9120.00

1020	Mild steel rivets (v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	Carriage of Steel Carriage of steel (0.160+0.053+0.091+0.099+0.007+0.005) = 0.415 tonne LABOUR:	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40
0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron 9.5 x 0.4 = 3.80 sqm. + Struts 2.70 x 0.16 = 0.43 sqm. + Ties 5.4x0.124 = 0.67 sqm. + Braces 2 x 1.84 x 0.12 = 0.44 sqm. + Ties 2.8x0.12 = 0.34 sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number 13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

Add Water Charges @ 1% except on A ie on (30081.43-249.92=29831.51)				298.32
TOTAL				30379.75
Add CPOH @ 15% except on A ie on (30379.75-249.92=30129.83)				4519.47
TOTAL				34898.25

Cost of 395.0 kg	34898.25
Cost of 1 kg	88.35
Say	88.35

Cost index	35.59 %				31.44
Total with Cost index					119.79

Grit/Screen Chamber 3m dia
1 Specification Code: 2.6.1

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63

Add CPOH @ 15%	205.89
TOTAL	1578.52
Cost of 10.0 cum	1578.52
Cost per cum	157.85
Say	157.85

Cost index 35.59 %	56.18
Total with Cost index	214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
TOTAL					675.50
Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

	Cost index 35.59 %				27.92
	Total with Cost index				106.37

3 Specification Code: od226282/2022_2023

od226282/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m

Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 356.61*1.3559 =483.52	cum	35.82000	483.52	17319.69
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					27835.74
	cost for 3.0 metre				27835.74
	cost for one metre				9278.58
	say				9278.58

	Add Water Charges @ 1.0%				92.78
	Add CPOH @ 15.0%				1405.70
	Cost index 35.59 %				82.67

	Total with Cost index				10859.75
	Say				10859.75

4 Specification Code: od226285/2022_2023

od226285/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m

Quantity for 3.0m depth=3.14*1.95*1.95*3=35.82m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 389.02.19*1.3559 =527.48	cum	35.82000	527.48	18894.33
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					29410.38
	cost for 3.0 metre				29410.38
	cost for one metre				9803.46
	say				9803.46

	Add Water Charges @ 1.0%				98.03
	Add CPOH @ 15.0%				1485.22
	Cost index 35.59 %				82.67

	Total with Cost index				11469.39
	Say				11469.39

5 Specification Code: od247482/2022_2023

od247482/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 4.5m to 6.0m (R1)

Quantity for 3.0m depth= $3.14 \times 2.1^2 \times 3 = 41.5422\text{m}^3$

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%= $175.78 \times 1.01 \times 1.15 \times 1.3559 = 276.83$

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.4 489.5 *1.3559 =663.71	cum	41.54220	663.71	27571.97
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	41.54220	276.83	11500.13
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					39672.10
	cost for 3.0 metre				39672.10
	cost for one metre				13224.03
	say				13224.03

	Add Water Charges @ 1.0%				132.24
	Add CPOH @ 15.0%				2003.44
	Cost index 35.59 %				82.67

	Total with Cost index				15442.39
	Say				15442.39

6 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	<p>Details of cost for 26.39 sqm</p> <p>Surface area</p> <p>Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm</p> <p>MATERIAL:</p> <p>Assuming that the timber will become unserviceable after being used 8 times</p> <p>planks 38 mm (Second class kail wood</p> <p>$26.39 \times 0.038 = 1.00$ cum</p> <p>Wastage 2% = 0.20 cum.</p> <p>Total = 1.20 cum . or 1200 cudm.</p> <p>Qty for cost using once = $1200/8 = 150$ cudm</p>				

1198	Second class kail wood in planks 2nd class kail wood battens Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712 \text{ cum}$ Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798 \text{ cum}$ Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = $0.1586/8 = 0.0198 \text{ cum}$	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside $25 \times 1.00 = 25.00 \text{ m}$ Outside $28 \times 1.00 = 28.00 \text{ m}$ Total = 53.00 m Qty for cost using once = $53/8 = 6.625 \text{ m}$ Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Cost index	35.59 %				65.54
Total with Cost index					249.69

7 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1

All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00

0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL					5977.32
Add Water Charges @ 1%					59.77
TOTAL					6037.09
Add CPOH @ 15%					905.56
TOTAL					6942.65
Cost of 1.0 cum					6942.65
Say					6942.65

Cost index 35.59 %					2470.89
Total with Cost index					9413.54

8 Specification Code: 5.33.2

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content

considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2 All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30

0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level $0.75 \times 2.5 = 1.88$	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL					7026.36
Add Water Charges @ 1%					70.26
TOTAL					7096.62
Add CPOH @ 15%					1064.49
TOTAL					8161.11
Cost of 1.0 cum					8161.11
Say					8161.1

	Cost index 35.59 %				2904.54
	Total with Cost index				11065.64

9 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40

2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80

TOTAL	52.12
Add Water Charges @ 1%	.52
TOTAL	52.64
Add CPOH @ 15%	7.90
TOTAL	60.54
Cost of 1.0 cum	60.54
Say	60.55

Cost index 35.59 %	21.55
Total with Cost index	82.10

10 Specification Code: od226292/2022_2023

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od226292/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

11 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90

0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

TOTAL					5073.95
Add Water Charges @ 1%					50.74
TOTAL					5124.69
Add CPOH @ 15%					768.70
TOTAL					5893.39
Cost of 1.0 cum					5893.39
Say					5893.4

Cost index 35.59 %					2097.46
Total with Cost index					7990.86

Other Engineering Organisations

PRICE

12 Specification Code: 10.1

SUBHEAD : 10.0

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				

1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34

AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)					63.17
TOTAL					6512.45
AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)					957.07
TOTAL					7470.00
Cost of 100.0 kilogram					7470.00
Cost of 1 kilogram					74.70
Say					74.7

	Cost index 35.59 %				26.59
	Total with Cost index				101.29

13 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04
TOTAL					4578.85
Add Water Charges @ 1%					45.79
TOTAL					4624.64

Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

Cost index 35.59 %	1892.80
Total with Cost index	7211.15

14 Specification Code: 5.22.5

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.5 Hard drawn steel wire fabric

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Hard drawn steel wire fabric 100kg/7.75 kg = 12.903 sqm Wastage 5% = 0.64 sqm Total = 13.548 sqm				
1021	Hard drawn steel wire fabric	sqm	13.548	430.00	5825.64
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For cutting and laying in position	L.S	26.0	2.00	52.00
0103	Blacksmith 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	1.5	558.00	837.00
9999	Sundries-and binding wire	L.S	13.52	2.00	27.04

TOTAL	6887.17
Add Water Charges @ 1%	68.87
TOTAL	6956.04
Add CPOH @ 15%	1043.41
TOTAL	7999.45
Cost of 100.0 kilogram	7999.45
Cost per kilogram	79.99
Say	80.0

Cost index 35.59 %	28.47
Total with Cost index	108.47

15 Specification Code: 13.52.1

13.52

Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1

On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92

9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25
Cost of 10.0 sqm					1647.25
Cost per sqm					164.72
Say					164.7

Cost index 35.59 %					58.62
Total with Cost index					223.32

16 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				

0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40

TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95
Cost per cum					190.69
Say					190.7

	Cost index	35.59 %			67.87
	Total with Cost index				258.57

17	Specification Code: 19.16
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SUBHEAD : 19.0

DRAINAGE

19.16

Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. floor rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number 4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) 1st class	Day	0.02	738.00	14.76
0124	Mason (brick layer) 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
Add Water Charges @ 1% except on A ie on (354.8-62.7=292.1)					2.92
TOTAL					357.72
Add CPOH @ 15% except on A ie on (357.72-62.7=295.02)					44.25
TOTAL					401.95
Cost of 1.0 each					401.95
Cost of 1 each					401.95
Say					401.95

	Cost index 35.59 %				143.05
	Total with Cost index				545.00

18 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whitening

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46
Other Engineering Organisations TOTAL					287.76
Add Water Charges @ 1%					2.88
TOTAL					290.64
Add CPOH @ 15%					43.60
TOTAL					334.24
Cost of 10.0 sqm					334.24
Cost per sqm					33.42
Say					33.4

	Cost index 35.59 %				11.89
	Total with Cost index				45.29

19 Specification Code: 10.2

SUBHEAD : 10.0**STEEL WORK****10.2**

Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				
1007	Structural steel such as tees, angles, channels and R.S. joists (ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+ Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+ Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg. Total = 50.65 kg+ Add wastage @ 5% = 2.53kg Total = 53.18kg. = 0.53 qtl	quintal	1.6	4600.00	7360.00

1009	<p>Flats exceeding 10 mm in thickness</p> <p>(iii) Gusset plates 10 mm thick: $1 \times 0.74 \times 0.35 \text{m} = 0.259 \text{ sqm.} +$ Shone $4 \times 0.46 \times 0.46 = 0.845 \text{ sqm.}$ Total = 1.104 sqm. $1.104 \text{ sqm} @ 78.4 \text{ kg/m} = 86.55 \text{ kg}$ 12 mm plates at the point of principal rafter and strut: $2 \times 0.3 \times 0.2 = 0.12 \text{ sqm.} +$ Tie beam, brace and strut: $2 \times 0.5 \times 0.3 = 0.30 \text{ sqm.} +$ Sole plates: $2 \times 0.46 \times 0.46 = 0.42 \text{ sqm.} +$ Anchor plate: $2 \times 0.46 \times 0.1 = 0.09 \text{ sqm.}$ Total = 0.93 sqm. Say 1.00 sqm. $1.00 \text{ sqm.} @ 94.4 \text{ kg/m} = 94.40 \text{ kg.}$ Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00 kg or 1.90 q</p>	quintal	0.53	4600.00	2438.00
1010	<p>Mild steel plates</p> <p>(iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.</p>	quintal	1.9	4800.00	9120.00
1020	<p>Mild steel rivets</p> <p>(v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm</p>	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	<p>Carriage of Steel</p> <p>Carriage of steel $(0.160 + 0.053 + 0.091 + 0.099 + 0.007 + 0.005) =$ 0.415 tonne LABOUR:</p>	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40

0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron $9.5 \times 0.4 = 3.80$ sqm. + Struts $2.70 \times 0.16 = 0.43$ sqm. + Ties $5.4 \times 0.124 = 0.67$ sqm. + Braces $2 \times 1.84 \times 0.12 = 0.44$ sqm. + Ties $2.8 \times 0.12 = 0.34$ sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number 13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

Add Water Charges @ 1% except on A ie on (30081.43-249.92=29831.51)				298.32
TOTAL				30379.75
Add CPOH @ 15% except on A ie on (30379.75-249.92=30129.83)				4519.47
TOTAL				34898.25
Cost of 395.0 kg				34898.25
Cost of 1 kg				88.35
Say				88.35

	Cost index 35.59 %				31.44
	Total with Cost index				119.79

20 Specification Code: od247845/2022_2023

od247845/2022_2023 :Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal

seating, spindle made of Stainless steel, CI head stock with gear arrangement and hand wheel fitted in well.

Code	Description	Unit	Quantity	Rate	Amount
MR	Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangement and hand wheel fitted in well. 	each	1.00000	248251.00	248251.00
TOTAL					248251.00
	cost for 1.1615 each				248251.00
	cost for one each				213733.10
	say				213733.10

	Add Water Charges @ 1.0%				2137.33
	Add CPOH @ 15.0%				32380.56
	Cost index 35.59 %				0.00
	Total with Cost index				248251.00
	Say				248251.00

Silt Pit 1.5mx1.5mx1.2m

1 Specification Code: 2.6.1

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89
TOTAL					1578.52
Cost of 10.0 cum					1578.52
Cost per cum					157.85
Say					157.85

	Cost index 35.59 %				56.18
	Total with Cost index				214.03

2 Specification Code: 2.26.1

2.26

Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80

TOTAL					675.50
Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

	Cost index 35.59 %			27.92
	Total with Cost index			106.37

3 Specification Code: 2.27

2.27

Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62

0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95

TOTAL					14597.33
Add Water Charges @ 1%					145.97
TOTAL					14743.30
Add CPOH @ 15%					2211.49
TOTAL					16954.79
Cost of 10.0 cum					16954.79
Cost per cum					1695.48
Say					1695.5

Cost index 35.59 %					603.43
Total with Cost index					2298.93

Other Engineering Organisations

4 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00

0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL	4578.85
Add Water Charges @ 1%	45.79
TOTAL	4624.64
Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

Cost index 35.59 %	1892.80
Total with Cost index	7211.15

5 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1

All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00

0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL					5977.32
Add Water Charges @ 1%					59.77
TOTAL					6037.09
Add CPOH @ 15%					905.56
TOTAL					6942.65
Cost of 1.0 cum					6942.65
Say					6942.65

Cost index 35.59 %					2470.89
Total with Cost index					9413.54

6 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
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	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80

	TOTAL	52.12
	Add Water Charges @ 1%	.52
	TOTAL	52.64
	Add CPOH @ 15%	7.90
	TOTAL	60.54
	Cost of 1.0 cum	60.54
	Say	60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

7 Specification Code: od226292/2022_2023

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od226292/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60

TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

8 Specification Code: 5.22.6

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6

Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in position	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL	6241.51
Add Water Charges @ 1%	62.42
TOTAL	6303.93
Add CPOH @ 15%	945.59
TOTAL	7249.52
Cost of 100.0 kilogram	7249.52
Cost per kilogram	72.50
Say	72.5

Cost index 35.59 %	25.80
Total with Cost index	98.30

9 Specification Code: 13.52.1

13.52

Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1

On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92

9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25
Cost of 10.0 sqm					1647.25
Cost per sqm					164.72
Say					164.7

Cost index 35.59 %					58.62
Total with Cost index					223.32

10 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
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	<p>Details of cost for 26.39 sqm</p> <p>Surface area</p> <p>Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm</p> <p>MATERIAL:</p> <p>Assuming that the timber will become unserviceable after being used 8 times</p> <p>planks 38 mm (Second class kail wood</p> <p>$26.39 \times 0.038 = 1.00$ cum</p> <p>Wastage 2% = 0.20 cum.</p> <p>Total = 1.20 cum . or 1200 cudm.</p> <p>Qty for cost using once = $1200/8 = 150$ cudm</p>				
1198	<p>Second class kail wood in planks</p> <p>2nd class kail wood battens</p> <p>Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712$ cum</p> <p>Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798$ cum</p> <p>Total = 0.1510 cum.</p> <p>Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm</p> <p>Qty for cost using once = $0.1586/8 = 0.0198$ cum</p>	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)
0302	<p>Safeda ballies 125 mm diameter</p> <p>Inside $25 \times 1.00 = 25.00$ m</p> <p>Outside $28 \times 1.00 = 28.00$ m</p> <p>Total = 53.00 m</p> <p>Qty for cost using once = $53/8 = 6.625$ m</p> <p>Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material</p> <p>$(P+Q+R)/6 = (3750.00+0.50+245.12/6)$</p>	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Cost index	35.59 %				65.54
Total with Cost index					249.69

11 Specification Code: 2.25

2.25

Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95

Cost per cum	190.69
Say	190.7

Cost index 35.59 %	67.87
Total with Cost index	258.57

Valve chamber 2.3mx3.8mx1.9m

1 Specification Code: 2.6.1

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89

TOTAL	1578.52
Cost of 10.0 cum	1578.52
Cost per cum	157.85
Say	157.85

Cost index 35.59 %	56.18
Total with Cost index	214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
TOTAL					675.50
Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

Cost index 35.59 %	27.92
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	Total with Cost index				106.37
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3 Specification Code: 2.27

2.27

Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
Other Engineering Organisations TOTAL					14597.33
Add Water Charges @ 1%					145.97
TOTAL					14743.30
Add CPOH @ 15%					2211.49
TOTAL					16954.79
Cost of 10.0 cum					16954.79
Cost per cum					1695.48
Say					1695.5

	Cost index 35.59 %				603.43
	Total with Cost index				2298.93

4 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90

9999	Sundries-	L.S	13.52	2.00	27.04
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TOTAL					4578.85
Add Water Charges @ 1%					45.79
TOTAL					4624.64
Add CPOH @ 15%					693.70
TOTAL					5318.34
Cost of 1.0 cum					5318.34
Say					5318.35

Cost index 35.59 %					1892.80
Total with Cost index					7211.15

5 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50

0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Other Engineering Organisations	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65

Cost of 1.0 cum	6942.65
Say	6942.65

Cost index 35.59 %	2470.89
Total with Cost index	9413.54

6 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

7 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in position	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
TOTAL					6241.51
Add Water Charges @ 1%					62.42
TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52

Cost per kilogram	72.50
Say	72.5

Cost index 35.59 %	25.80
Total with Cost index	98.30

8 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	<p>Details of cost for 26.39 sqm</p> <p>Surface area</p> <p>Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm</p> <p>MATERIAL:</p> <p>Assuming that the timber will become unserviceable after being used 8 times</p> <p>planks 38 mm (Second class kail wood</p> <p>$26.39 \times 0.038 = 1.00$ cum</p> <p>Wastage 2% = 0.20 cum.</p> <p>Total = 1.20 cum . or 1200 cudm.</p> <p>Qty for cost using once = $1200/8 = 150$ cudm</p>				

1198	Second class kail wood in planks 2nd class kail wood battens Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712 \text{ cum}$ Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798 \text{ cum}$ Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = $0.1586/8 = 0.0198 \text{ cum}$	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside $25 \times 1.00 = 25.00 \text{ m}$ Outside $28 \times 1.00 = 28.00 \text{ m}$ Total = 53.00 m Qty for cost using once = $53/8 = 6.625 \text{ m}$ Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Cost index	35.59 %				65.54
Total with Cost index					249.69

9 Specification Code: 5.9.16.1

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.16 Edges of slabs and breaks in floors and walls

5.9.16.1 Under 20 cm wide

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a 3mx3m slab 15cms thick 12m edge Length MATERIAL: Assuming that the timber will become unserviceable after being used 8 times				
1198	Second class kail wood in planks (i) Planks 30 mm thick (2nd class Kail wood or equivalent local soft wood) $4 \times 3 \times 0.15 \times 0.030 = 0.54 \text{ cum}$ Wastage @ 5% = 0.003 cum. Total = 0.057 cum Qty taken for cost of using once = $57/8 = 7.125 \text{ cudm}$	10 cud m	7.125	260.00	185.25
1197	Second class kail wood in scantling (ii) Battens 75 mm x 100 mm (2nd class Kail wood) Horizontal $2 \times 4 \times 0.075 \times 0.1 \times 0.5 = 0.030$ Horizontal $2 \times 4 \times 0.075 \times 0.1 \times 1.5 = 0.090$ (iii) Vertical battens $16 \times 0.15 \times 0.075 \times 0.030 \text{m} = 0.0054$ (iv) Struts $16 \times 0.25 \times 0.07 \times 0.075 = 0.0225$ Total = 0.1479 Wastage @ 5% = 0.0074 Total = 0.1553 cum = 155 cudm Qty taken for cost of using once = $155/8 = 19.375 \text{ cudm}$	10 cud m	19.375	260.00	503.75

2204	Carriage of Timber Planks = 0.057 cum. Batte4ns = 0.057 cum. Total = 0.212 cum. Qty taken for cost of using once = $0.212/8 = 0.0265$ cum LABOUR: For assembling erection dismantling & cleaning	cum	0.0265	118.59	3.14
0112	Carpenter 2nd class	Day	0.81	679.00	549.99
0114	Beldar	Day	0.54	558.00	301.32
9999	Sundries-	L.S	5.2	2.00	10.40

TOTAL					1553.85
Add Water Charges @ 1%					15.54
TOTAL					1569.39
Add CPOH @ 15%					235.41
Other Engineering Organisations TOTAL					1804.80
Cost of 12.0 metre					1804.80
Cost per metre					150.40
Say					150.4

	Cost index 35.59 %				53.53
	Total with Cost index				203.93

10 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
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	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40

	TOTAL	1641.80
	Add Water Charges @ 1%	16.42
	TOTAL	1658.22
	Add CPOH @ 15%	248.73
	TOTAL	1906.95
	Cost of 10.0 cum	1906.95
	Cost per cum	190.69
	Say	190.7

	Cost index 35.59 %	67.87
	Total with Cost index	258.57

11 Specification Code: 19.16

SUBHEAD : 19.0

DRAINAGE

19.16

Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded

stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foot rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number 4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) 1st class	Day	0.02	738.00	14.76
0124	Mason (brick layer) 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
Add Water Charges @ 1% except on A ie on (354.8-62.7=292.1)					2.92
TOTAL					357.72
Add CPOH @ 15% except on A ie on (357.72-62.7=295.02)					44.25
TOTAL					401.95
Cost of 1.0 each					401.95
Cost of 1 each					401.95
Say					401.95

	Cost index 35.59 %				143.05
	Total with Cost index				545.00

Pumpsets

1 Specification Code: od237036/2022_2023

od237036/2022_2023 :Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 20 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years

MR for Submercible pumpset -Av Rs. 18135 (based on KWA estimate approved rates)

Hence for 20HP pump= 20hp@Rs.18135=RS. 362700

Code	Description	Unit	Quantity	Rate	Amount
MR	20hp pumpset	each set	1.00000	362700.00	362700.00
TOTAL					362700.00
cost for one each set					362700.00
	say				362700.00

	Add Water Charges @ 1.0%				3627.00
	Add CPOH @ 15.0%				54949.05
	Cost index 35.59 %				0.00
	Total with Cost index				421276.05
	Say				421276.05

2 Specification Code: od238037/2022_2023

od238037/2022_2023 :Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 5 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years

MR for Submercible pumpset -Av Rs. 18135 (based on KWA estimate approved rates)

Hence for 5HP pump= 5hp@Rs.18135=RS. 90675

Code	Description	Unit	Quantity	Rate	Amount
MR	5HP pumpset	each set	1.00000	90675.00	90675.00
TOTAL					90675.00
cost for one each set					90675.00
	say				90675.00

	Add Water Charges @ 1.0%				906.75
	Add CPOH @ 15.0%				13737.26
	Cost index 35.59 %				0.00
	Total with Cost index				105319.01
	Say				105319.01

Collection Well 3m Dia

1 Specification Code: 2.6.1

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89
TOTAL					1578.52
Cost of 10.0 cum					1578.52
Cost per cum					157.85
Say					157.85

	Cost index 35.59 %				56.18
	Total with Cost index				214.03

2 Specification Code: 2.26.1

2.26

Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80

	TOTAL	675.50
	Add Water Charges @ 1%	6.75
	TOTAL	682.25
	Add CPOH @ 15%	102.34
	TOTAL	784.59
	Cost of 10.0 cum	784.59
	Cost per cum	78.46
	Say	78.45

	Cost index 35.59 %	27.92
	Total with Cost index	106.37

3 Specification Code: od237409/2022_2023

od237409/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 1.5m to 3m (R1)

Quantity for 3.0m depth=3.14*2.1*2.1*3=41.5422m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
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MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 414.2 *1.3559 =561.61	cum	41.54220	561.61	23330.51
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	41.54220	276.83	11500.13
9999	Sundries	L.S	300.00000	2.00	600.00

TOTAL					35430.64
	cost for 3.0 metre				35430.64
	cost for one metre				11810.21
	say				11810.21

	Add Water Charges @ 1.0%				118.10
	Add CPOH @ 15.0%				1789.24
	Cost index 35.59 %				82.67
	Total with Cost index				13800.23
	Say				13800.23

4 Specification Code: od237410/2022_2023

od237410/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 3m to 4.5m (R1)

Quantity for 3.0m depth=3.14*2.1*2.1*3=41.5422m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
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MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.3 451.85 *1.3559 =612.66	cum	41.54220	612.66	25451.24
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	41.54220	276.83	11500.13
9999	Sundries	L.S	300.00000	2.00	600.00

TOTAL					37551.37
	cost for 3.0 metre				37551.37
	cost for one metre				12517.12
	say				12517.12

	Add Water Charges @ 1.0%				125.17
	Add CPOH @ 15.0%				1896.34
	Cost index 35.59 %				82.67
	Total with Cost index				14621.31
	Say				14621.31

5 Specification Code: od247482/2022_2023

od247482/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 4.5m to 6.0m (R1)

Quantity for 3.0m depth=3.14*2.1*2.1*3=41.5422m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
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MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.4 489.5 *1.3559 =663.71	cum	41.54220	663.71	27571.97
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	41.54220	276.83	11500.13
9999	Sundries	L.S	300.00000	2.00	600.00

TOTAL					39672.10
	cost for 3.0 metre				39672.10
	cost for one metre				13224.03
	say				13224.03

	Add Water Charges @ 1.0%				132.24
	Add CPOH @ 15.0%				2003.44
	Cost index 35.59 %				82.67
	Total with Cost index				15442.39
	Say				15442.39

6 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
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	<p>Details of cost for 26.39 sqm</p> <p>Surface area</p> <p>Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm</p> <p>MATERIAL:</p> <p>Assuming that the timber will become unserviceable after being used 8 times</p> <p>planks 38 mm (Second class kail wood</p> <p>$26.39 \times 0.038 = 1.00$ cum</p> <p>Wastage 2% = 0.20 cum.</p> <p>Total = 1.20 cum . or 1200 cudm.</p> <p>Qty for cost using once = $1200/8 = 150$ cudm</p>				
1198	<p>Second class kail wood in planks</p> <p>2nd class kail wood battens</p> <p>Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712$ cum</p> <p>Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798$ cum</p> <p>Total = 0.1510 cum.</p> <p>Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm</p> <p>Qty for cost using once = $0.1586/8 = 0.0198$ cum</p>	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)
0302	<p>Safeda ballies 125 mm diameter</p> <p>Inside $25 \times 1.00 = 25.00$ m</p> <p>Outside $28 \times 1.00 = 28.00$ m</p> <p>Total = 53.00 m</p> <p>Qty for cost using once = $53/8 = 6.625$ m</p> <p>Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material</p> <p>$(P+Q+R)/6 = (3750.00+0.50+245.12/6)$</p>	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Cost index	35.59 %				65.54
Total with Cost index					249.69

7 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00

2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

	Cost index 35.59 %				2470.89
	Total with Cost index				9413.54

8 Specification Code: 5.33.2

5.33 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2 All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44

7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level $0.75 \times 2.5 = 1.88$	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL				7026.36
Add Water Charges @ 1%				70.26
TOTAL				7096.62
Add CPOH @ 15%				1064.49
TOTAL				8161.11
Cost of 1.0 cum				8161.11
Say				8161.1

	Cost index 35.59 %				2904.54
	Total with Cost index				11065.64

9 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

10 Specification Code: od237411/2022_2023

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od237411/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Other Engineering Say Organisations				1916.05

11 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.67	1350.00	904.50

0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries- Other Engineering Organisations	L.S	14.3	2.00	28.60

PRICE				TOTAL	5073.95
				Add Water Charges @ 1%	50.74
				TOTAL	5124.69
				Add CPOH @ 15%	768.70
				TOTAL	5893.39
				Cost of 1.0 cum	5893.39
				Say	5893.4

	Cost index 35.59 %				2097.46
	Total with Cost index				7990.86

12 Specification Code: 10.1

SUBHEAD : 10.0**STEEL WORK****10.1**

Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				
1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34
AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)					63.17
TOTAL					6512.45
AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)					957.07
TOTAL					7470.00

Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

Cost index	35.59 %				26.59
Total with Cost index					101.29

13 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77

0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL					4578.85
Add Water Charges @ 1%					45.79
TOTAL					4624.64
Add CPOH @ 15%					693.70
TOTAL					5318.34
Cost of 1.0 cum					5318.34
Say					5318.35

Cost index 35.59 %					1892.80
Total with Cost index					7211.15

14 Specification Code: 5.22.6

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6

Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
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	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in position	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL					6241.51
Add Water Charges @ 1%					62.42
Other Engineering Organisations TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52
Cost per kilogram					72.50
Say					72.5

	Cost index 35.59 %				25.80
	Total with Cost index				98.30

15 Specification Code: 13.52.1

13.52

Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25
Cost of 10.0 sqm					1647.25
Cost per sqm					164.72
Say					164.7

	Cost index 35.59 %				58.62
	Total with Cost index				223.32

16 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95
Cost per cum					190.69
Say					190.7

	Cost index 35.59 %				67.87
	Total with Cost index				258.57

17 Specification Code: 19.16

SUBHEAD : 19.0**DRAINAGE****19.16**

Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foot rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number 4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) 1st class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
Add Water Charges @ 1% except on A ie on (354.8-62.7=292.1)					2.92
TOTAL					357.72

AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)	44.25
TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

Cost index 35.59 %	143.05
Total with Cost index	545.00

18 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whitening

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46
TOTAL					287.76
Add Water Charges @ 1%					2.88

TOTAL	290.64
Add CPOH @ 15%	43.60
TOTAL	334.24
Cost of 10.0 sqm	334.24
Cost per sqm	33.42
Say	33.4

Cost index 35.59 %	11.89
Total with Cost index	45.29

19 Specification Code: 10.2

SUBHEAD : 10.0

STEEL WORK

10.2

Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				

1007	<p>Structural steel such as tees, angles, channels and R.S. joists</p> <p>(ii) Tiles (flats) 50x12mm: $2 \times 2.7 = 5.4 \text{ m @ } 4.7 \text{ kg/m} = 25.38\text{kg}+$</p> <p>Ties central (flats): $50 \times 10\text{mm } 1 \times 2.80 = 2.8 \text{ m @ } 3.90 \text{ kg/m} = 10.92\text{kg}+$</p> <p>Braces (flats) 40x 10 mm: $2 \times 1.84 = 3.68\text{m @ } 3.9 \text{ kg/m} = 14.35 \text{ kg.}$</p> <p>Total = 50.65 kg+</p> <p>Add wastage @ 5% = 2.53kg</p> <p>Total = 53.18kg. = 0.53 qtl</p>	quintal	1.6	4600.00	7360.00
1009	<p>Flats exceeding 10 mm in thickness</p> <p>(iii) Gusset plates 10 mm thick: $1 \times 0.74 \times 0.35\text{m} = 0.259 \text{ sqm.}+$</p> <p>Shone $4 \times 0.46 \times 0.46 = 0.845 \text{ sqm.}$</p> <p>Total = 1.104 sqm.</p> <p>$1.104 \text{ sqm @ } 78.4 \text{ kg/m} = 86.55 \text{ kg}$</p> <p>12 mm plates at the point of principal rafter and strut: $2 \times 0.3 \times 0.2 = 0.12 \text{ sqm.} +$</p> <p>Tie beam, brace and strut: $2 \times 0.5 \times 0.3 = 0.30 \text{ sqm.} +$</p> <p>Sole plates: $2 \times 0.46 \times 0.46 = 0.42 \text{ sqm.}+$</p> <p>Anchor plate: $2 \times 0.46 \times 0.1 = 0.09\text{sqm.}$</p> <p>Total = 0.93 sqm. Say 1.00 sqm.</p> <p>$1.00 \text{ sqm. @ } 94.4 \text{ kg/m} = 94.40 \text{ kg.}$</p> <p>Total = 180.95 kg</p> <p>Add wastage @ 5% = 9.05 kg.</p> <p>Total = 190.00kg or 1.90 q</p>	quintal	0.53	4600.00	2438.00
1010	<p>Mild steel plates</p> <p>(iv) 16mm dia. 50 mm long rivets = 56 Nos.+</p> <p>Add wastage @ 5 % = 2.8 Nos.</p> <p>Total = 58.8 Nos.</p>	quintal	1.9	4800.00	9120.00

1020	Mild steel rivets (v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	Carriage of Steel Carriage of steel (0.160+0.053+0.091+0.099+0.007+0.005) = 0.415 tonne LABOUR:	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40
0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron 9.5 x 0.4 = 3.80 sqm. + Struts 2.70 x 0.16 = 0.43 sqm. + Ties 5.4x0.124 = 0.67 sqm. + Braces 2 x 1.84 x 0.12 = 0.44 sqm. + Ties 2.8x0.12 = 0.34 sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

AddWater Charges @ 1% except on A ie on (30081.43-249.92=29831.51)				298.32
TOTAL				30379.75
AddCPOH @ 15% except on A ie on (30379.75-249.92=30129.83)				4519.47
TOTAL				34898.25

Cost of 395.0 kg	34898.25
Cost of 1 kg	88.35
Say	88.35

Cost index 35.59 %					31.44
Total with Cost index					119.79

Odour control arrangements

1 Specification Code: od250116/2022_2023

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od250116/2022_2023 :Providing Advanced odor control mechanism as directed including supplying, erecting and testing cost of all materials, labour and conveyence charges, hire for tools and equipments etc complte all per the directions of Engineer in charge (For WW3)

Code	Description	Unit	Quantity	Rate	Amount
MR	Cost for odour control unit capacity -WW3:1020m3/hr	set	1.00000	1150000.00	1150000.00
MR	Cost for installation charges including civil and electrical items	set	1.00000	60000.00	60000.00
TOTAL					1210000.00
	cost for 1.16 each				1210000.00
	cost for one each				1043103.45
	say				1043103.45

Add Water Charges @ 1.0%					10431.03
Add CPOH @ 15.0%					158030.17

	Cost index 35.59 %				0.00
	Total with Cost index				1211564.66
	Say				1211564.66

Construction of pump room

1 Specification Code: od248171/2022_2023

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od248171/2022_2023 :RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in verified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.

Code	Description	Unit	Quantity	Rate	Amount
MR	RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in verified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications. Plinth area Rates 2012 CPWD	sqm	1.00000	19000.00	19000.00
MR	Add 60% cost Index for 2012 items	sqm	0.60000	19000.00	11400.00
TOTAL					30400.00
cost for one sqm					30400.00

	say				30400.00
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	Add Water Charges @ 1.0%				304.00
	Add CPOH @ 15.0%				4605.60
	Cost index 35.59 %				0.00
	Total with Cost index				35309.60
	Say				35309.60

Construction of Column & Erection of ISMB
1 Specification Code: 5.33.2

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2

All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20

0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level $0.75 \times 2.5 = 1.88$	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL	7026.36
Add Water Charges @ 1%	70.26
TOTAL	7096.62
Add CPOH @ 15%	1064.49
TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

	Cost index 35.59 %				2904.54
	Total with Cost index				11065.64

2 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

3 Specification Code: od237411/2022_2023

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od237411/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

4 Specification Code: 5.9.6

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.6 Columns, Pillars, Piers, Abutments, Posts and Struts

Code	Description	Unit	Quantity	Rate	Amount
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	<p>Details of cost for 4.5 sqm.</p> <p>Size of column 450x450mm and 2.5 m high</p> <p>Area of contact = $4 \times 0.45 \times 2.5 = 4.5$ sqm</p> <p>MATERIAL: Assuming shuttering will become unserviceable after use of 40 times</p> <p>Add maintenance charges @ 10 % of cost of material</p> <p>Less salvage value of material after full use @ 25% of cost of material</p>				
7331	<p>Wall form panel 1250x450xmm</p> <p>Qty taken for cost of using once = $8 \times 0.85 / 40 = 0.17$</p>	each	0.17	860.00	146.20
7332	<p>Corner angle 45x45x5 mm 2.50 long</p> <p>Qty taken for cost of using once = $4 \times 0.85 / 40 = 0.085$</p>	each	0.085	255.00	21.68
7333	<p>Column clamp 450x1070 mm</p> <p>Qty taken for cost of using once = $5 \times 0.85 / 40 = 0.1063$</p>	each	0.1063	965.00	102.58
7334	<p>Prop 2 m (2-3.5m)</p> <p>Qty taken for cost of using once = $4 \times 0.85 / 40 = 0.085$</p>	each	0.085	635.00	53.98
9999	Sundries-Qty taken for cost of using once = $1300 \times 0.85 / 40 = 27.62$	L.S	27.62	2.00	55.24
9977	Carriage LABOUR	L.S	52.0	2.00	104.00
0116	Fitter(grade1)	Day	1.0	738.00	738.00
0114	Beldar	Day	2.0	558.00	1116.00
9999	Sundries-Shuttering oil	L.S	39.0	2.00	78.00
9999	Sundries-Carriage	L.S	26.0	2.00	52.00

TOTAL	2467.68
Add Water Charges @ 1%	24.68
TOTAL	2492.36

Add CPOH @ 15%	373.85
TOTAL	2866.21
Cost of 4.5 sqm	2866.21
Cost per sqm	636.94
Say	636.95

Cost index	35.59 %				226.69
Total with Cost index					863.64

5 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in position	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
TOTAL					6241.51

Add Water Charges @ 1%	62.42
TOTAL	6303.93
Add CPOH @ 15%	945.59
TOTAL	7249.52
Cost of 100.0 kilogram	7249.52
Cost per kilogram	72.50
Say	72.5

Cost index 35.59 %	25.80
Total with Cost index	98.30

6 Specification Code: 13.52.1

Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32

7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25
Cost of 10.0 sqm					1647.25
Cost per sqm					164.72
Say					164.7

Cost index 35.59 %					58.62
Total with Cost index					223.32

7 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				

3.3	Rate as per item Number 3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL					2547.60
Add Water Charges @ 1%					25.48
TOTAL					2573.08
Add CPOH @ 15%					385.96
TOTAL					2959.04
Cost of 10.0 sqm					2959.04
Cost per sqm					295.90
Say					295.9

	Cost index 35.59 %				105.31
	Total with Cost index				401.21

8 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whitening

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46
TOTAL					287.76
Add Water Charges @ 1%					2.88
TOTAL					290.64
Add CPOH @ 15%					43.60
TOTAL					334.24
Cost of 10.0 sqm					334.24
Cost per sqm					33.42
Say					33.4

	Cost index 35.59 %				11.89
	Total with Cost index				45.29

9 Specification Code: 10.2

SUBHEAD : 10.0

STEEL WORK

10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and

framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				
1007	Structural steel such as tees, angles, channels and R.S. joists (ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+ Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+ Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg. Total = 50.65 kg+ Add wastage @ 5% = 2.53kg Total = 53.18kg. = 0.53 qtl	quintal	1.6	4600.00	7360.00

1009	<p>Flats exceeding 10 mm in thickness</p> <p>(iii) Gusset plates 10 mm thick: $1 \times 0.74 \times 0.35 \text{m} = 0.259 \text{ sqm.} +$ Shone $4 \times 0.46 \times 0.46 = 0.845 \text{ sqm.}$ Total = 1.104 sqm. $1.104 \text{ sqm} @ 78.4 \text{ kg/m} = 86.55 \text{ kg}$ 12 mm plates at the point of principal rafter and strut: $2 \times 0.3 \times 0.2 = 0.12 \text{ sqm.} +$ Tie beam, brace and strut: $2 \times 0.5 \times 0.3 = 0.30 \text{ sqm.} +$ Sole plates: $2 \times 0.46 \times 0.46 = 0.42 \text{ sqm.} +$ Anchor plate: $2 \times 0.46 \times 0.1 = 0.09 \text{ sqm.}$ Total = 0.93 sqm. Say 1.00 sqm. $1.00 \text{ sqm.} @ 94.4 \text{ kg/m} = 94.40 \text{ kg.}$ Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00 kg or 1.90 q</p>	quintal	0.53	4600.00	2438.00
1010	<p>Mild steel plates</p> <p>(iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.</p>	quintal	1.9	4800.00	9120.00
1020	<p>Mild steel rivets</p> <p>(v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm</p>	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	<p>Carriage of Steel</p> <p>Carriage of steel $(0.160 + 0.053 + 0.091 + 0.099 + 0.007 + 0.005) =$ 0.415 tonne LABOUR:</p>	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40

0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron $9.5 \times 0.4 = 3.80$ sqm. + Struts $2.70 \times 0.16 = 0.43$ sqm. + Ties $5.4 \times 0.124 = 0.67$ sqm. + Braces $2 \times 1.84 \times 0.12 = 0.44$ sqm. + Ties $2.8 \times 0.12 = 0.34$ sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number 13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

Add Water Charges @ 1% except on A ie on (30081.43-249.92=29831.51)				298.32
TOTAL				30379.75
Add CPOH @ 15% except on A ie on (30379.75-249.92=30129.83)				4519.47
TOTAL				34898.25
Cost of 395.0 kg				34898.25
Cost of 1 kg				88.35
Say				88.35

	Cost index 35.59 %				31.44
	Total with Cost index				119.79

10 Specification Code: od249219/2022_2023

od249219/2022_2023 :Charges for chain pulley block with travelling trolley of 2 Tonne capacity

Code	Description	Unit	Quantity	Rate	Amount
MR	Pulley Block - 2 Tonne	each	1.00000	14201.00	14201.00
MR	Extra length	metre	6.00000	735.00	4410.00
TOTAL					18611.00
	cost for 1.1615 each				18611.00
	cost for one each				16023.25
	say				16023.25

	Add Water Charges @ 1.0%				160.23
	Add CPOH @ 15.0%				2427.52
	Cost index 35.59 %				0.00
	Total with Cost index				18611.00
	Other Engineering Say Organisations				18611.00

PRICE

Sewerage Scheme- Construction of wet well 4 (Block) , Grit /Screen Chamber and connected works at Elamkulam STP

General Abstract

(Dsr year: **2018**, Cost Index Applied for this estimate is **35.59%**)

SI No	Heading Description	Amount
1	Colletion well 6m dia	4113552.66
2	Grit/Screen Chamber 3m dia	1654665.16
3	Silt Pit 1.5mx1.5mx1.2m	83922.07
4	Valve chamber 2.3mx3.8mx1.9m	246604.75
5	Pump sets	1263828.14
6	Construction of pump room	1017340.19
7	Cost for generator pedestal and mounting structure with roof sheet	100000.00
8	Construction of Column & Erection of ISMB	97076.62
9	Providing Advanced odor control mechanism as directed for OCU capacity WW4-1900m3/hr including cost for installation charges of civil and electrical items	1910000.00
Provision for GST payments (in %) @		0.0%
Amount reserved for GST payments		0.00
Total		10486990.00
Lumpsum for round off		3010.00
		TOTAL Rs 10490000.00
Other Engineering Organisations		Rounded Total Rs 1,04,90,000
PRICE		Rupees One Crore Four Lakh Ninety Thousand Only

(Cost Index Applied for this estimate is 35.59%)

Sewerage Scheme- Construction of wet well 4 (Block) , Grit /Screen Chamber and connected works at Elamkulam STP

Abstract Estimate

(Dsr year: **2018**, Cost Index Applied for this estimate is **35.59%**)

1 Colletion well 6m dia		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		100.480 cum
Say 100.480 cum @ Rs 214.03 / cum		Rs 21505.73
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		25.120 cum
Say 25.120 cum @ Rs 106.37 / cum		Rs 2672.01
3	od235530/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (6m diameter)	
Net Total Quantity		1.000 metre
Say 1.000 metre @ Rs 34446.20 / metre		Rs 34446.20
4	od235533/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (6m diameter)	
Net Total Quantity		1.500 metre
Say 1.500 metre @ Rs 36358.09 / metre		Rs 54537.13
5	od235535/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (6m diameter)	
Net Total Quantity		1.500 metre
Say 1.500 metre @ Rs 38272.80 / metre		Rs 57409.20

6	od235537/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (6m diameter)	
Net Total Quantity		1.500 metre
Say 1.500 metre @ Rs 40184.68 / metre		Rs 60277.02
7	od235540/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m (6m diameter)	
Net Total Quantity		0.950 metre
Say 0.950 metre @ Rs 42099.39 / metre		Rs 39994.42
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		252.528 sqm
Say 252.528 sqm @ Rs 249.69 / sqm		Rs 63053.72
9	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		114.093 cum
Say 114.093 cum @ Rs 9413.54 / cum		Rs 1074019.02
10	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
Net Total Quantity		12.435 cum
Say 12.435 cum @ Rs 11065.64 / cum		Rs 137601.23

11	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		126.528 cum
Say 126.528 cum @ Rs 82.10 / cum		Rs 10387.95
12	od235539/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		126.528 cum
Say 126.528 cum @ Rs 1916.05 / cum		Rs 242433.97
13	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
Net Total Quantity		7.065 cum
Say 7.065 cum @ Rs 7990.86 / cum		Rs 56455.43
14	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		382.076 kilogram
Say 382.076 kilogram @ Rs 101.29 / kilogram		Rs 38700.48
15	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		13.678 cum
Say 13.678 cum @ Rs 7211.15 / cum		Rs 98634.11
16	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		15638.938 kilogram
Say 15638.938 kilogram @ Rs 98.30 / kilogram		Rs 1537307.61
17	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
Net Total Quantity		781.947 sqm
Say 781.947 sqm @ Rs 223.32 / sqm		Rs 174624.40

18	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		43.960 cum
Say 43.960 cum @ Rs 258.57 / cum		Rs 11366.74
19	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
Net Total Quantity		29.000 each
Say 29.000 each @ Rs 545.00 / each		Rs 15805.00
20	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whitening	
Net Total Quantity		35.043 sqm
Say 35.043 sqm @ Rs 45.29 / sqm		Rs 1587.10
21	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		1105.962 kg
Say 1105.962 kg @ Rs 119.79 / kg		Rs 132483.19
22	od247921/2022_2023 Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangment and hand wheel fitted in well. 	
Net Total Quantity		1.000 each
Say 1.000 each @ Rs 248251.00 / each		Rs 248251.00
2 Grit/Screen Chamber 3m dia		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	

Net Total Quantity		40.836 cum
Say 40.836 cum @ Rs 214.03 / cum		Rs 8740.13
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		10.209 cum
Say 10.209 cum @ Rs 106.37 / cum		Rs 1085.93
3	od235529/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m	
Net Total Quantity		1.000 metre
Say 1.000 metre @ Rs 10859.75 / metre		Rs 10859.75
4	od235532/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m	
Net Total Quantity		1.500 metre
Say 1.500 metre @ Rs 11469.39 / metre		Rs 17204.09
5	od235536/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m	
Net Total Quantity		1.500 metre
Say 1.500 metre @ Rs 12078.90 / metre		Rs 18118.35
6	od235879/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)	
Net Total Quantity		1.100 metre
Say 1.100 metre @ Rs 16674.35 / metre		Rs 18341.79
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		118.764 sqm

Say 118.764 sqm @ Rs 249.69 / sqm		Rs 29654.18
8	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work upto plinth level	
Net Total Quantity		37.792 cum
Say 37.792 cum @ Rs 9413.54 / cum		Rs 355756.50
9	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work above plinth level upto floor V level	
Net Total Quantity		4.875 cum
Say 4.875 cum @ Rs 11065.64 / cum		Rs 53944.99
10	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		42.667 cum
Say 42.667 cum @ Rs 82.10 / cum		Rs 3502.96
11	od235539/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		42.667 cum
Say 42.667 cum @ Rs 1916.05 / cum		Rs 81752.11
12	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	
Net Total Quantity		1.767 cum
Say 1.767 cum @ Rs 7990.86 / cum		Rs 14119.85

13	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		206.958 kilogram
Say 206.958 kilogram @ Rs 101.29 / kilogram		Rs 20962.78
14	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		2.120 cum
Say 2.120 cum @ Rs 7211.15 / cum		Rs 15287.64
15	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric	
Net Total Quantity		5247.719 kilogram
Say 5247.719 kilogram @ Rs 108.47 / kilogram		Rs 569220.08
16	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
Net Total Quantity		266.558 sqm
Say 266.558 sqm @ Rs 223.32 / sqm		Rs 59527.73
17	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		26.706 cum
Say 26.706 cum @ Rs 258.57 / cum		Rs 6905.37
18	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
Net Total Quantity		24.000 each
Say 24.000 each @ Rs 545.00 / each		Rs 13080.00

19	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
Net Total Quantity		17.121 sqm
Say 17.121 sqm @ Rs 45.29 / sqm		Rs 775.41
20	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		898.026 kg
Say 898.026 kg @ Rs 119.79 / kg		Rs 107574.53
21	od247921/2022_2023 Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangment and hand wheel fitted in well. 	
Net Total Quantity		1.000 each
Say 1.000 each @ Rs 248251.00 / each		Rs 248251.00
3 Silt Pit 1.5mx1.5mx1.2m		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		12.936 cum
Say 12.936 cum @ Rs 214.03 / cum		Rs 2768.69
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		1.176 cum
Say 1.176 cum @ Rs 106.37 / cum		Rs 125.09
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
Net Total Quantity		1.176 cum
Say 1.176 cum @ Rs 2298.93 / cum		Rs 2703.54
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	

Net Total Quantity		0.485 cum
Say 0.485 cum @ Rs 7211.15 / cum		Rs 3497.41
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work upto plinth level	
Net Total Quantity		3.043 cum
Say 3.043 cum @ Rs 9413.54 / cum		Rs 28645.40
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		3.043 cum
Say 3.043 cum @ Rs 82.10 / cum		Rs 249.83
7	od235539/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		3.043 cum
Say 3.043 cum @ Rs 1916.05 / cum		Rs 5830.54
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		304.300 kilogram
Say 304.300 kilogram @ Rs 98.30 / kilogram		Rs 29912.69
9	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On steel work	
Net Total Quantity		15.459 sqm
Say 15.459 sqm @ Rs 223.32 / sqm		Rs 3452.30
10	5.9.12 Centering and shuttering including strutting, etc. and removal of form for: Well steining	
Net Total Quantity		21.250 sqm
Say 21.250 sqm @ Rs 249.69 / sqm		Rs 5305.91

11	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		5.533 cum
Say 5.533 cum @ Rs 258.57 / cum		Rs 1430.67
4 Valve chamber 2.3mx3.8mx1.9m		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		45.215 cum
Say 45.215 cum @ Rs 214.03 / cum		Rs 9677.37
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		12.507 cum
Say 12.507 cum @ Rs 106.37 / cum		Rs 1330.37
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
Net Total Quantity		2.886 cum
Say 2.886 cum @ Rs 2298.93 / cum		Rs 6634.71
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		1.584 cum
Say 1.584 cum @ Rs 7211.15 / cum		Rs 11422.46
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		9.961 cum

Say 9.961 cum @ Rs 9413.54 / cum		Rs 93768.27
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		9.961 cum
Say 9.961 cum @ Rs 82.10 / cum		Rs 817.80
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		996.100 kilogram
Say 996.100 kilogram @ Rs 98.30 / kilogram		Rs 97916.63
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for: Well steining	
Net Total Quantity		60.901 sqm
Say 60.901 sqm @ Rs 249.69 / sqm		Rs 15206.37
9	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for: Edges of slabs and breaks in floors and walls Under 20 cm wide	
Net Total Quantity		14.200 metre
Say 14.200 metre @ Rs 203.93 / metre		Rs 2895.81
10	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		14.174 cum
Say 14.174 cum @ Rs 258.57 / cum		Rs 3664.97
11	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1 cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size) Complete as per design	
Net Total Quantity		6.000 each
Say 6.000 each @ Rs 545.00 / each		Rs 3270.00

5 Pump sets		
1	od236188/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 20 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years	
Net Total Quantity		2.000 each set
Say 2.000 each set @ Rs 421276.05 / each set		Rs 842552.10
2	od236193/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 15 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years	
Net Total Quantity		1.000 each set
Say 1.000 each set @ Rs 315957.04 / each set		Rs 315957.04
3	od236240/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 5 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years	
Net Total Quantity		1.000 each set
Say 1.000 each set @ Rs 105319.01 / each set		Rs 105319.01
6 Construction of pump room		

1	od248172/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in verified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.	
Net Total Quantity		28.812 sqm
Say 28.812 sqm @ Rs 35309.60 / sqm		Rs 1017340.20
7 Cost for generator pedestal and mounting structure with roof sheet		
Lump-Sum Total		Rs 100000.00
8 Construction of Column & Erection of ISMB		
1	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
Net Total Quantity		0.540 cum
Say 0.540 cum @ Rs 11065.64 / cum		Rs 5975.45
2	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		0.540 cum
Say 0.540 cum @ Rs 82.10 / cum		Rs 44.33
3	od249222/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		0.540 cum
Say 0.540 cum @ Rs 1916.05 / cum		Rs 1034.67
4	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts	
Net Total Quantity		7.200 sqm
Say 7.200 sqm @ Rs 863.64 / sqm		Rs 6218.21

5	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		54.000 kilogram
Say 54.000 kilogram @ Rs 98.30 / kilogram		Rs 5308.20
6	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
Net Total Quantity		10.088 sqm
Say 10.088 sqm @ Rs 223.32 / sqm		Rs 2252.85
7	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
Net Total Quantity		7.380 sqm
Say 7.380 sqm @ Rs 401.21 / sqm		Rs 2960.93
8	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
Net Total Quantity		7.380 sqm
Say 7.380 sqm @ Rs 45.29 / sqm		Rs 334.24
9	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		453.600 kg
Say 453.600 kg @ Rs 119.79 / kg		Rs 54336.74
10	od249403/2022_2023 Charges for chain pulley block with travelling trolley of 2 Tonne capacity	
Net Total Quantity		1.000 each
Say 1.000 each @ Rs 18611.00 / each		Rs 18611.00
9 Providing Advanced odor control mechanism as directed for OCU capacity WW4-1900m3/hr including cost for installation charges of civil and electrical items		
Lump-Sum Total		Rs 1910000.00
	Provision for GST payments (in %) @	0.0%
Amount reserved for GST payments		0.00
Total		10486990.00
Lumpsum for round off		3010.00

TOTAL Rs 10490000.00
Rounded Total Rs 1,04,90,000
Rupees One Crore Four Lakh Ninety Thousand Only

(Cost Index Applied for this estimate is 35.59%)



Other Engineering Organisations

PRICE

Sewerage Scheme- Construction of wet well 4 (Block) , Grit /Screen Chamber and connected works at Elamkulam STP

Detailed Estimate

(Dsor year: **2018**, Cost Index Applied for this estimate is **35.59%**)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
1 Colletion well 6m dia								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	First depth 0 to 1.5m	3.14/4	8.000	8.000	1.500		75.360	
	Second depth 1.5m to 2m	3.14/4	8.000	8.000	0.500		25.120	
	Total Quantity						100.480 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						100.480 cum	
	Say 100.480 cum @ Rs 214.03 / cum						Rs 21505.73	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
	For Earth work 1.5m to 2m	1*3.14/4	8.000	8.000	0.500		25.120	
	Total Quantity						25.120 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						25.120 cum	
	Say 25.120 cum @ Rs 106.37 / cum						Rs 2672.01	
3	od235530/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (6m diameter)							
		1	1.000				1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 34446.20 / metre						Rs 34446.20	

4	od235533/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (6m diameter)							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 36358.09 / metre						Rs 54537.13	
5	od235535/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (6m diameter)							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 38272.80 / metre						Rs 57409.20	
6	od235537/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (6m diameter)							
		1			1.500		1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 40184.68 / metre						Rs 60277.02	
7	od235540/2022_2023 Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m (6m diameter)							
		1			0.950		0.950	
	Total Quantity						0.950 metre	

	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.950 metre	
	Say 0.950 metre @ Rs 42099.39 / metre						Rs 39994.42	
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Upto 1m above and 3m below GL -well Kerb - inner	1*3.14	6.000	0.600			11.304	
	well Kerb - outer	1*3.14	7.350	1.330			30.696	
	well Kerb - Slope	3.14	6+6.53		0.900		35.410	
	Side wall	1*3.14	6.600		8.450		175.118	
	Total Quantity						252.528 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						252.528 sqm	
	Say 252.528 sqm @ Rs 249.69 / sqm						Rs 63053.72	
9	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	6.000	6.000	0.600		16.956	
	From 1.5m to 4.5m below ground level-kerb	4.5					4.500	$((0.675*0.6)+(0.15*0.725)+(0.5*(0.675-0.15)*0.725))*21$
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	6.600	0.600	7.450		92.637	
	Total Quantity						114.093 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						114.093 cum	

	Say 114.093 cum @ Rs 9413.54 / cum						Rs 1074019.02	
10	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	3.14	6.600	0.600	1.000		12.435	
	Total Quantity						12.435 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						12.435 cum	
	Say 12.435 cum @ Rs 11065.64 / cum						Rs 137601.23	
11	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	6.000	6.000	0.600		16.956	
	From 1.5m to 4.5m below ground level-kerb	4.5					4.500	$((0.675 \times 0.6) + (0.15 \times 0.725) + (0.5 \times (0.675 - 0.15) \times 0.725)) \times 21$
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	6.600	0.600	7.450		92.637	
	Side wall	3.14	6.600	0.600	1.000		12.435	
	Total Quantity						126.528 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						126.528 cum	
	Say 126.528 cum @ Rs 82.10 / cum						Rs 10387.95	
12	od235539/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							

	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	6.000	6.000	0.600		16.956	
	From 1.5m to 4.5m below ground level-kerb	4.5					4.500	$((0.675 \times 0.6) + (0.15 \times 0.725) + (0.5 \times (0.675 - 0.15) \times 0.725)) \times 21$
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	6.600	0.600	7.450		92.637	
	Side wall	3.14	6.600	0.600	1.000		12.435	
	Total Quantity						126.528 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						126.528 cum	
	Say 126.528 cum @ Rs 1916.05 / cum						Rs 242433.97	
13	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	Benching	3.14/4	6.000	6.000	0.250		7.065	
	Total Quantity						7.065 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						7.065 cum	
	Say 7.065 cum @ Rs 7990.86 / cum						Rs 56455.43	
14	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	7.200	16.900			382.076	
	Total Quantity						382.076 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						382.076 kilogram	
	Say 382.076 kilogram @ Rs 101.29 / kilogram						Rs 38700.48	
15	4.1.6							

	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging bottom	3.14/4	6.600	6.600	0.400		13.678	
	Total Quantity						13.678 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						13.678 cum	
	Say 13.678 cum @ Rs 7211.15 / cum						Rs 98634.11	
16	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	6.000	6.000	0.600	120.0	2034.720	
	From 1.5m to 4.5m below ground level-kerb	4.5				120.0	540.000	$((0.675*0.6)+(0.15*0.725)+(0.5*(0.675-0.15)*0.725))*21$
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	6.600	0.600	7.450	120.0	11116.354	
	Side wall	3.14	6.600	0.600	1.000	120.0	1492.128	
	Wastage 2.5%	15191.18				0.03	455.736	
	Total Quantity						15638.938 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						15638.938 kilogram	
	Say 15638.938 kilogram @ Rs 98.30 / kilogram						Rs 1537307.61	
17	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		15638.938				0.05	781.947	0.0508 m2/kg
	Total Quantity						781.947 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						781.947 sqm	

	Say 781.947 sqm @ Rs 223.32 / sqm						Rs 174624.40	
18	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total volume of the well	1*3.14/4	6.000	6.000	2.000		-56.520	
	First depth 0 to 1.5m	3.14/4	8.000	8.000	1.500		75.360	
	Second depth 1.5m to 2m	3.14/4	8.000	8.000	0.500		25.120	
	Total Quantity						100.480 cum	
	Total Deducted Quantity						-56.520 cum	
	Net Total Quantity						43.960 cum	
	Say 43.960 cum @ Rs 258.57 / cum						Rs 11366.74	
19	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		29					29.000	
	Total Quantity						29.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						29.000 each	
	Say 29.000 each @ Rs 545.00 / each						Rs 15805.00	
20	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	Well outer 1m above GL)	1*3.14	7.200	1.000			22.608	
	top of wall thickness	1*3.14	6.600	0.600			12.435	
	Total Quantity						35.043 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						35.043 sqm	
	Say 35.043 sqm @ Rs 45.29 / sqm						Rs 1587.10	

21	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Area of pumping station(64sqm)							
	(33*0.58)+(17*0.28)=24.23 kg/m	1	40.694			24.23	986.016	25 x 3 flats at 30 mm spacing=3 nos@0.59, 12 x 3 flats at 60 mm spacing=17@.28
	25 x6 SS for outer frame@1.18kg/m	1*3.14	7.200			1.18	26.678	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	7.200			3.92	56.448	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	6.000			4.47	26.820	
	Misc. items for opening frame	1	10.000				10.000	
	Total Quantity						1105.962 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						1105.962 kg	
	Say 1105.962 kg @ Rs 119.79 / kg						Rs 132483.19	
22	od247921/2022_2023 Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangment and hand wheel fitted in well. 							
		1					1.000	
	Total Quantity						1.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						1.000 each	
	Say 1.000 each @ Rs 248251.00 / each						Rs 248251.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark

2 Grit/Screen Chamber 3m dia								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	For 0 to 1.5 m	1*3.14/4	5.100	5.100	1.500		30.627	
	For 1.5m to 2 m	1*3.14/4	5.100	5.100	0.500		10.209	
	Total Quantity						40.836 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						40.836 cum	
	Say 40.836 cum @ Rs 214.03 / cum						Rs 8740.13	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
	For 1.5m to 2m	1*3.14/4	5.100	5.100	0.500		10.209	
	Total Quantity						10.209 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						10.209 cum	
	Say 10.209 cum @ Rs 106.37 / cum						Rs 1085.93	
3	od235529/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m							
		1	1.000				1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 10859.75 / metre						Rs 10859.75	
4	od235532/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m							
		1	1.500				1.500	
	Total Quantity						1.500 metre	

Total Deducted Quantity								0.000 metre
Net Total Quantity								1.500 metre
Say 1.500 metre @ Rs 11469.39 / metre								Rs 17204.09
5	od235536/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m							
		1	1.500					1.500
Total Quantity								1.500 metre
Total Deducted Quantity								0.000 metre
Net Total Quantity								1.500 metre
Say 1.500 metre @ Rs 12078.90 / metre								Rs 18118.35
6	od235879/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)							
		1	1.100					1.100
Total Quantity								1.100 metre
Total Deducted Quantity								0.000 metre
Net Total Quantity								1.100 metre
Say 1.100 metre @ Rs 16674.35 / metre								Rs 18341.79
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Well kerb inner	1*3.14	3.000	0.450				4.240
	Well kerb outer	1*3.14	4.050	1.050				13.353
	Well kerb Slope	1*3.14	3.000+3.3 8		0.710			14.224
	Side wall	1*3.14	3.900	7.100				86.947
Total Quantity								118.764 sqm
Total Deducted Quantity								0.000 sqm
Net Total Quantity								118.764 sqm
Say 118.764 sqm @ Rs 249.69 / sqm								Rs 29654.18
8	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement							

	concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	
	Well kerb	1	11.070	0.525	0.450		2.616	Circum=3.14*3.53=11.07
		1	11.070	0.150	0.600		0.997	Circum=3.14*3.53=11.07
		1*5	11.070	0.380	0.600		1.262	Circum=3.14*3.53=11.07
	Side Wall	3.14	3.450	0.450	6.100		29.737	Circum=3.14*3.53=11.07
	Total Quantity						37.792 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						37.792 cum	
	Say 37.792 cum @ Rs 9413.54 / cum						Rs 355756.50	
9	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	1*3.14	3.450	0.450	1.000		4.875	
	Total Quantity						4.875 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						4.875 cum	
	Say 4.875 cum @ Rs 11065.64 / cum						Rs 53944.99	
10	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade							

	BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	
	Well kerb	1	11.070	0.525	0.450		2.616	Circum=3.14*3.53=11.07
		1	11.070	0.150	0.600		0.997	Circum=3.14*3.53=11.07
		1*5	11.070	0.380	0.600		1.262	Circum=3.14*3.53=11.07
	Side Wall	3.14	3.450	0.450	6.100		29.737	Circum=3.14*3.53=11.07
	Side wall	1*3.14	3.450	0.450	1.000		4.875	
	Total Quantity						42.667 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						42.667 cum	
	Say 42.667 cum @ Rs 82.10 / cum						Rs 3502.96	
11	od235539/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180	
	Well kerb	1	11.070	0.525	0.450		2.616	Circum=3.14*3.53=11.07
		1	11.070	0.150	0.600		0.997	Circum=3.14*3.53=11.07
		1*5	11.070	0.380	0.600		1.262	Circum=3.14*3.53=11.07
	Side Wall	3.14	3.450	0.450	6.100		29.737	Circum=3.14*3.53=11.07
	Side wall	1*3.14	3.450	0.450	1.000		4.875	
	Total Quantity						42.667 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						42.667 cum	

	Say 42.667 cum @ Rs 1916.05 / cum						Rs 81752.11	
12	4.1.3 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)							
	Benching	1*3.14/4	3.000	3.000	0.250		1.767	
	Total Quantity						1.767 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.767 cum	
	Say 1.767 cum @ Rs 7990.86 / cum						Rs 14119.85	
13	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	3.900	16.900			206.958	
	Total Quantity						206.958 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						206.958 kilogram	
	Say 206.958 kilogram @ Rs 101.29 / kilogram						Rs 20962.78	
14	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging the bottom of the well	1*3.14/4	3.000	3.000	0.300		2.120	
	Total Quantity						2.120 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.120 cum	
	Say 2.120 cum @ Rs 7211.15 / cum						Rs 15287.64	
15	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric							
	B o t t o m slab@120kg/m3 of concrete	1*3.14	1.500	1.500	0.450	120.0	381.510	

	Well kerb@120kg/m3 of concrete	1	11.070	0.525	0.450	120.0	313.835	Circum=3.14*3.53=11.07
	@ 120 kg / m 3 of concrete	1	11.070	0.150	0.600	120.0	119.556	Circum=3.14*3.53=11.07
	@ 120 kg / m 3 of concrete	1*5	11.070	0.380	0.600	120.0	151.438	Circum=3.14*3.53=11.07
	Side Wall@120kg/m3 of concrete	3.14	3.450	0.450	6.100	120.0	3568.391	Circum=3.14*3.53=11.07
	Side wall@120kg/m3 of concrete	1*3.14	3.450	0.450	1.000	120.0	584.983	
	wastage at 2.5%	5120.23			2.5/100		128.006	
	Total Quantity						5247.719 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						5247.719 kilogram	
	Say 5247.719 kilogram @ Rs 108.47 / kilogram						Rs 569220.08	
16	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On steel work							
		5247.19	0.0508				266.558	
	Total Quantity						266.558 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						266.558 sqm	
	Say 266.558 sqm @ Rs 223.32 / sqm						Rs 59527.73	
17	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Earthwork Qty as per item 1	1	40.836				40.836	
	Volume of well	1*3.14/4	3.000	3.000	2.000		-14.130	
	Total Quantity						40.836 cum	
	Total Deducted Quantity						-14.130 cum	
	Net Total Quantity						26.706 cum	

	Say 26.706 cum @ Rs 258.57 / cum						Rs 6905.37	
18	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		24					24.000	
	Total Quantity						24.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						24.000 each	
	Say 24.000 each @ Rs 545.00 / each						Rs 13080.00	
19	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	Well outer	1	3.140	3.900	1.000		12.246	
	Wall top	1	3.140	3.450	0.450		4.875	
	Total Quantity						17.121 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						17.121 sqm	
	Say 17.121 sqm @ Rs 45.29 / sqm						Rs 775.41	
20	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Area of slant screen(3*1.8)=5.4sqm							
	weight of 29 nos 50mmx10mm flats at 3 5 m m spacing@3.92k/m	29	4.500			3.92	511.560	
	50 x 10mm SS for o u t e r frame @ 3.92 Kg/m	1	(3+1.8)*2			3.92	37.632	
	Area of pumping station 12sqm							
	25 x 3 flats at 30 mm spacing@.58kg/m	33	12.000			0.59	233.640	

	12 x 3 flats at 60 mm spacing	17	12.000			0.28	57.121	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.900			3.92	30.576	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	1.800			4.47	8.046	
	Misc. items for opening frame	1	5.000				5.000	
	25 x6 SS for outer frame	3.14	3.900			1.18	14.451	@1.18kg/m
	Total Quantity						898.026 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						898.026 kg	
	Say 898.026 kg @ Rs 119.79 / kg						Rs 107574.53	
21	od247921/2022_2023 Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangement and hand wheel fitted in well. 							
		1					1.000	
	Total Quantity						1.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						1.000 each	
	Say 1.000 each @ Rs 248251.00 / each						Rs 248251.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
3 Silt Pit 1.5mx1.5mx1.2m								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	2.800	2.800	1.650		12.936	
	Total Quantity						12.936 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						12.936 cum	

	Say 12.936 cum @ Rs 214.03 / cum						Rs 2768.69	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
		1	2.800	2.800	0.150		1.176	
	Total Quantity						1.176 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.176 cum	
	Say 1.176 cum @ Rs 106.37 / cum						Rs 125.09	
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	2.800	2.800	0.150		1.176	
	Total Quantity						1.176 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.176 cum	
	Say 1.176 cum @ Rs 2298.93 / cum						Rs 2703.54	
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	2.200	2.200	0.100		0.485	
	Total Quantity						0.485 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.485 cum	
	Say 0.485 cum @ Rs 7211.15 / cum						Rs 3497.41	
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	

	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 9413.54 / cum						Rs 28645.40	
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 82.10 / cum						Rs 249.83	
7	od235539/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 1916.05 / cum						Rs 5830.54	
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more							
	100Kg/m3 of concrete	1	3.043	100.000			304.300	
	Total Quantity						304.300 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						304.300 kilogram	
	Say 304.300 kilogram @ Rs 98.30 / kilogram						Rs 29912.69	

9	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On steel work							
	@0.0508sqm/kg	304.300				0.05	15.459	
	Total Quantity						15.459 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						15.459 sqm	
	Say 15.459 sqm @ Rs 223.32 / sqm						Rs 3452.30	
10	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Base slab side	4	2.000		0.200		1.600	
	Inner side	4	1.500		1.200		7.200	
	Outer side	4	2.000		1.200		9.600	
	Baffle wall	2	1.500		0.950		2.850	
	Total Quantity						21.250 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						21.250 sqm	
	Say 21.250 sqm @ Rs 249.69 / sqm						Rs 5305.91	
11	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total Excavation Item 1	1	12.936				12.936	
	Sand filling item 2	1	1.176				-1.176	
	PCC item3	1	0.485				-0.485	
	RCC item5	1	3.043				-3.043	
	Pit size	1	1.500	1.500	1.200		-2.699	
	Total Quantity						12.936 cum	
	Total Deducted Quantity						-7.403 cum	
	Net Total Quantity						5.533 cum	
	Say 5.533 cum @ Rs 258.57 / cum						Rs 1430.67	
SI No	Description	No	L	B	D	CF	Quantity	Remark
4 Valve chamber 2.3mx3.8mx1.9m								

1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil
	13.7005.2002.35045.215
	Total Quantity45.215 cum
	Total Deducted Quantity0.000 cum
	Net Total Quantity45.215 cum
	Say 45.215 cum @ Rs 214.03 / cum Rs 9677.37
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil
	13.7005.2000.65012.507
	Total Quantity12.507 cum
	Total Deducted Quantity0.000 cum
	Net Total Quantity12.507 cum
	Say 12.507 cum @ Rs 106.37 / cum Rs 1330.37
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.
	13.7005.2000.1502.886
	Total Quantity2.886 cum
	Total Deducted Quantity0.000 cum
	Net Total Quantity2.886 cum
	Say 2.886 cum @ Rs 2298.93 / cum Rs 6634.71
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)
	13.3004.8000.1001.584
	Total Quantity1.584 cum
	Total Deducted Quantity0.000 cum
	Net Total Quantity1.584 cum
	Say 1.584 cum @ Rs 7211.15 / cum Rs 11422.46
5	5.33.1

	Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Raft	1	3.100	4.600	0.200		2.853	
	Walls	2	2.700	0.200	1.900		2.052	
		2	3.800	0.200	1.900		2.888	
	slab	1	2.800	4.300	0.180		2.168	
	Total Quantity						9.961 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						9.961 cum	
	Say 9.961 cum @ Rs 9413.54 / cum						Rs 93768.27	
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Raft	1	3.100	4.600	0.200		2.853	
	Walls	2	2.700	0.200	1.900		2.052	
		2	3.800	0.200	1.900		2.888	
	slab	1	2.800	4.300	0.180		2.168	
	Total Quantity						9.961 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						9.961 cum	
	Say 9.961 cum @ Rs 82.10 / cum						Rs 817.80	
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	@ 100kg per m3 concrete	1	9.961	100.000			996.100	
	Total Quantity						996.100 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						996.100 kilogram	
	Sav 996.100 kilogram @ Rs 98.30 / kilogram						Rs 97916.63	

8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Raft	2	3.100		0.200		1.241	
		2		4.600	0.200		1.840	
	Walls outer	2	2.700		1.900		10.260	
		2		4.200	1.900		15.960	
	Walls inner	2	3.800		1.900		14.440	
		2		3.900	2.200		17.160	
	Total Quantity						60.901 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						60.901 sqm	
	Say 60.901 sqm @ Rs 249.69 / sqm						Rs 15206.37	
9	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide							
	Cover slab	2	2.800+4.3				14.200	
	Total Quantity						14.200 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						14.200 metre	
	Say 14.200 metre @ Rs 203.93 / metre						Rs 2895.81	
10	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total excavated earth Item 1	1	45.210				45.210	
	Sand filling Item 2	1	2.890				-2.890	
	PCC item 3	1	1.580				-1.580	
	RCC item 4	1	9.961				-9.961	
	Chamber size	1	2.300	3.800	1.900		-16.605	
	Total Quantity						45.210 cum	
	Total Deducted Quantity						-31.036 cum	
	Net Total Quantity						14.174 cum	
	Say 14.174 cum @ Rs 258.57 / cum						Rs 3664.97	
11	19.16							

	Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design								
		6					6.000		
	Total Quantity							6.000	each
	Total Deducted Quantity							0.000	each
	Net Total Quantity							6.000	each
	Say 6.000 each @ Rs 545.00 / each							Rs 3270.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
5 Pump sets									
1	od236188/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 20 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years								
		2					2.000		
	Total Quantity							2.000	each set
	Total Deducted Quantity							0.000	each set
	Net Total Quantity							2.000	each set
	Say 2.000 each set @ Rs 421276.05 / each set							Rs 842552.10	
2	od236193/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 15 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years								

		1					1.000	
	Total Quantity						1.000	each set
	Total Deducted Quantity						0.000	each set
	Net Total Quantity						1.000	each set
	Say 1.000 each set @ Rs 315957.04 / each set						Rs 315957.04	
3	od236240/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 5 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years							
		1					1.000	
	Total Quantity						1.000	each set
	Total Deducted Quantity						0.000	each set
	Net Total Quantity						1.000	each set
	Say 1.000 each set @ Rs 105319.01 / each set						Rs 105319.01	
SI No	Description	No	L	B	D	CF	Quantity	Remark
6 Construction of pump room								
1	od248172/2022_2023 RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in coloumn and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in verified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty.The sanitary/Plumping and Electrical works are followed by standard specifications.							
		1	6.460	4.460			28.812	
	Total Quantity						28.812	sqm
	Total Deducted Quantity						0.000	sqm
	Net Total Quantity						28.812	sqm
	Say 28.812 sqm @ Rs 35309.60 / sqm						Rs 1017340.20	
SI No	Description	No	L	B	D	CF	Quantity	Remark
7 Cost for generator pedestal and mounting structure with roof sheet								
Lump-Sum Total						Rs 100000.00		

	SI No	Description	No	L	B	D	CF	Quantity
Remark	8 Construction of Column & Erection of ISMB							
1	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	above G.L for column	2	0.300	0.300	0.500		0.090	
	above 1.5m from G.L for column	2	0.300	0.300	2.500		0.450	
	Total Quantity						0.540 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.540 cum	
	Say 0.540 cum @ Rs 11065.64 / cum						Rs 5975.45	
2	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	above G.L for column	2	0.300	0.300	0.500		0.090	
	above 1.5m from G.L for column	2	0.300	0.300	2.500		0.450	
	Total Quantity						0.540 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.540 cum	
	Say 0.540 cum @ Rs 82.10 / cum						Rs 44.33	
3	od249222/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	above G.L for column	2	0.300	0.300	0.500		0.090	
	above 1.5m from G.L for column	2	0.300	0.300	2.500		0.450	
	Total Quantity						0.540 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.540 cum	

	Say 0.540 cum @ Rs 1916.05 / cum						Rs 1034.67	
4	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts							
	upto 3.0m from G.L for column	8	0.300		2.000		4.800	
	above 3.0 m to 4.0 m	8	0.300		1.000		2.400	
	Total Quantity						7.200 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						7.200 sqm	
	Say 7.200 sqm @ Rs 863.64 / sqm						Rs 6218.21	
5	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
		1	0.540	100.000			54.000	
	Total Quantity						54.000 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						54.000 kilogram	
	Say 54.000 kilogram @ Rs 98.30 / kilogram						Rs 5308.20	
6	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		1	54.000	0.0508			2.744	
		1	7.200		0.600		4.320	
		2	7.200	0.210			3.024	
	Total Quantity						10.088 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						10.088 sqm	
	Say 10.088 sqm @ Rs 223.32 / sqm						Rs 2252.85	
7	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	sides	8	0.300		3.000		7.200	
		2	0.300	0.300			0.180	
	Total Quantity						7.380 sqm	

	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						7.380 sqm	
	Say 7.380 sqm @ Rs 401.21 / sqm						Rs 2960.93	
8	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	sides	8	0.300		3.000		7.200	
		2	0.300	0.300			0.180	
	Total Quantity						7.380 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						7.380 sqm	
	Say 7.380 sqm @ Rs 45.29 / sqm						Rs 334.24	
9	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Supply and fixing ISHB 300mm of 63kg/m for 7.2m on column over suction well	1	63.000	7.200			453.600	
	Total Quantity						453.600 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						453.600 kg	
	Say 453.600 kg @ Rs 119.79 / kg						Rs 54336.74	
10	od249403/2022_2023 Charges for chain pulley block with travelling trolley of 2 Tonne capacity							
		1					1.000	
	Total Quantity						1.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						1.000 each	
	Say 1.000 each @ Rs 18611.00 / each						Rs 18611.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
9 Providing Advanced odor control mechanism as directed for OCU capacity WW4-1900m3/hr including cost for installation charges of civil and electrical items								
Lump-Sum Total						Rs 1910000.00		
Provision for GST payments (in %) @							0.0%	

Amount reserved for GST payments	0.00
Total	10486990.00
Lumpsum for round off	3010.00
TOTAL Rs 10490000.00	
Rounded Total Rs 1,04,90,000	
Rupees One Crore Four Lakh Ninety Thousand Only	

(Cost Index Applied for this estimate is 35.59%)



Other Engineering Organisations

PRICE

Data Analysis

Colletion well 6m dia					
1 Specification Code: 2.6.1					

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89
TOTAL					1578.52
Cost of 10.0 cum					1578.52
Cost per cum					157.85
Say					157.85

	Cost index	35.59 %			56.18
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	Total with Cost index				214.03
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2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
TOTAL					675.50
Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

	Cost index 35.59 %				27.92
	Total with Cost index				106.37

3 Specification Code: od235530/2022_2023

od235530/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. 1.5m to 3m (6m diameter)

Quantity for 3.0m depth=3.14*3.6*3.6*3=122.08m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPOH) 100.3.5.2 328.41*1.3559	cum	122.08000	445.29	54361.00
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	122.08000	276.83	33795.41
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					88756.41
	cost for 3.0 metre				88756.41
	cost for one metre				29585.47
	say				29585.47

	Add Water Charges @ 1.0%				295.85
	Add CPOH @ 15.0%				4482.19
	Cost index 35.59 %				82.67
	Total with Cost index				34446.20
	Say				34446.20

4 Specification Code: od235533/2022_2023

od235533/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3m to 4.5m (6m diameter)

Quantity for 3.0m depth= $3.14 \times 3.6 \times 3.6 \times 3 = 122.08 \text{m}^3$

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%= $175.78 \times 1.01 \times 1.15 \times 1.3559 = 276.83$

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.3 $358.24 \times 1.3559 = 485.74$	cum	122.08000	485.74	59299.14
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	122.08000	276.83	33795.41
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					93694.55
	cost for 3.0 metre				93694.55
	cost for one metre				31231.52
	say				31231.52

	Add Water Charges @ 1.0%				312.31
	Add CPOH @ 15.0%				4731.57
	Cost index 35.59 %				82.67
	Total with Cost index				36358.09
	Say				36358.09

5 Specification Code: od235535/2022_2023

od235535/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m (6m diameter)

Quantity for 3.0m depth=3.14*3.6*3.6*3=122.08m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.4 388.12*1.3559 =485.74	cum	122.08000	526.25	64244.60
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	122.08000	276.83	33795.41
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					98640.01
	cost for 3.0 metre				98640.01
	cost for one metre				32880.00
	say				32880.00

	Add Water Charges @ 1.0%				328.80
	Add CPOH @ 15.0%				4981.32
	Cost index 35.59 %				82.67
	Total with Cost index				38272.80
	Say				38272.80

6 Specification Code: od235537/2022_2023

od235537/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 6.0m to 7.5m (6m diameter)

Quantity for 3.0m depth=3.14*3.6*3.6*3=122.08m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.5 417.95*1.3559 =566.70	cum	122.08000	566.70	69182.74
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	122.08000	276.83	33795.41
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					103578.15
	cost for 3.0 metre				103578.15
	cost for one metre				34526.05
	say				34526.05

	Add Water Charges @ 1.0%				345.26
	Add CPOH @ 15.0%				5230.69
	Cost index 35.59 %				82.67
	Total with Cost index				40184.68
	Say				40184.68

7 Specification Code: od235540/2022_2023

od235540/2022_2023 :Sinking wells above up to 3.5 m dia. and up to 6.0m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 7.5m to 9.0m (6m diameter)

Quantity for 3.0m depth=3.14*3.6*3.6*3=122.08m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.5.6 447.82*1.3559 =607.21	cum	122.08000	607.21	74128.20
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	122.08000	276.83	33795.41
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					108523.61
	cost for 3.0 metre				108523.61
	cost for one metre				36174.53
	say				36174.53

	Add Water Charges @ 1.0%				361.74
	Add CPOH @ 15.0%				5480.44
	Cost index 35.59 %				82.67
	Total with Cost index				42099.39
	Say				42099.39

8 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	<p>Details of cost for 26.39 sqm</p> <p>Surface area</p> <p>Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm</p> <p>MATERIAL:</p> <p>Assuming that the timber will become unserviceable after being used 8 times</p> <p>planks 38 mm (Second class kail wood</p> <p>$26.39 \times 0.038 = 1.00$ cum</p> <p>Wastage 2% = 0.20 cum.</p> <p>Total = 1.20 cum . or 1200 cudm.</p> <p>Qty for cost using once = $1200/8 = 150$ cudm</p>				
1198	<p>Second class kail wood in planks</p> <p>2nd class kail wood battens</p> <p>Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712$ cum</p> <p>Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798$ cum</p> <p>Total = 0.1510 cum.</p> <p>Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm</p> <p>Qty for cost using once = $0.1586/8 = 0.0198$ cum</p>	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = $53/8 = 6.625$ m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material $(P+Q+R)/6 = (3750.00+0.50+245.12/6)$	metre	6.625	40.00	265.00(R)
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Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations

Cost index	35.59 %		65.54
Total with Cost index			249.69

9 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1

All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00
TOTAL					5977.32

Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

Cost index 35.59 %	2470.89
Total with Cost index	9413.54

10 Specification Code: 5.33.2

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2

All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20

0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level $0.75 \times 2.5 = 1.88$	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL	7026.36
Add Water Charges @ 1%	70.26
TOTAL	7096.62
Add CPOH @ 15%	1064.49
TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

	Cost index 35.59 %				2904.54
	Total with Cost index				11065.64

11 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

12 Specification Code: od235539/2022_2023

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od235539/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

13 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				

0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

TOTAL				5073.95
Add Water Charges @ 1%				50.74
TOTAL				5124.69
Add CPOH @ 15%				768.70
TOTAL				5893.39
Cost of 1.0 cum				5893.39
Say				5893.4

Cost index		35.59 %			2097.46
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	Total with Cost index				7990.86
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14 Specification Code: 10.1

SUBHEAD : 10.0

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				
1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34
AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)					63.17
TOTAL					6512.45

AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)	957.07
TOTAL	7470.00
Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

Cost index	35.59 %				26.59
Total with Cost index					101.29

15 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31

2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL				4578.85
Add Water Charges @ 1%				45.79
TOTAL				4624.64
Add CPOH @ 15%				693.70
TOTAL				5318.34
Cost of 1.0 cum				5318.34
Say				5318.35

Cost index 35.59 %					1892.80
Total with Cost index					7211.15

16 Specification Code: 5.22.6

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6

Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
TOTAL					6241.51
Add Water Charges @ 1%					62.42
TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52
Cost per kilogram					72.50
Say					72.5

	Cost index 35.59 %				25.80
	Total with Cost index				98.30

17 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and

applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25
Cost of 10.0 sqm					1647.25

Cost per sqm	164.72
Say	164.7

Cost index 35.59 %	58.62
Total with Cost index	223.32

18 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95
Cost per cum					190.69
Say					190.7

Cost index 35.59 %	67.87
Total with Cost index	258.57

19 Specification Code: 19.16

SUBHEAD : 19.0**DRAINAGE****19.16**

Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foot rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number 4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) 1st class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
Add Water Charges @ 1% except on A ie on (354.8-62.7=292.1)					2.92

TOTAL	357.72
AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)	44.25
TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

Cost index 35.59 %	143.05
Total with Cost index	545.00

20 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whitening

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46
TOTAL					287.76

Add Water Charges @ 1%	2.88
TOTAL	290.64
Add CPOH @ 15%	43.60
TOTAL	334.24
Cost of 10.0 sqm	334.24
Cost per sqm	33.42
Say	33.4

Cost index 35.59 %	11.89
Total with Cost index	45.29

21 Specification Code: 10.2

SUBHEAD : 10.0

STEEL WORK

10.2

Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				

1007	<p>Structural steel such as tees, angles, channels and R.S. joists</p> <p>(ii) Tiles (flats) 50x12mm: $2 \times 2.7 = 5.4 \text{ m @ } 4.7 \text{ kg/m} = 25.38\text{kg}+$</p> <p>Ties central (flats): $50 \times 10\text{mm } 1 \times 2.80 = 2.8 \text{ m @ } 3.90 \text{ kg/m} = 10.92\text{kg}+$</p> <p>Braces (flats) 40x 10 mm: $2 \times 1.84 = 3.68\text{m @ } 3.9 \text{ kg/m} = 14.35 \text{ kg.}$</p> <p>Total = 50.65 kg+</p> <p>Add wastage @ 5% = 2.53kg</p> <p>Total = 53.18kg. = 0.53 qtl</p>	quintal	1.6	4600.00	7360.00
1009	<p>Flats exceeding 10 mm in thickness</p> <p>(iii) Gusset plates 10 mm thick: $1 \times 0.74 \times 0.35\text{m} = 0.259 \text{ sqm.}+$</p> <p>Shone $4 \times 0.46 \times 0.46 = 0.845 \text{ sqm.}$</p> <p>Total = 1.104 sqm.</p> <p>$1.104 \text{ sqm @ } 78.4 \text{ kg/m} = 86.55 \text{ kg}$</p> <p>12 mm plates at the point of principal rafter and strut: $2 \times 0.3 \times 0.2 = 0.12 \text{ sqm.} +$</p> <p>Tie beam, brace and strut: $2 \times 0.5 \times 0.3 = 0.30 \text{ sqm.} +$</p> <p>Sole plates: $2 \times 0.46 \times 0.46 = 0.42 \text{ sqm.}+$</p> <p>Anchor plate: $2 \times 0.46 \times 0.1 = 0.09\text{sqm.}$</p> <p>Total = 0.93 sqm. Say 1.00 sqm.</p> <p>$1.00 \text{ sqm. @ } 94.4 \text{ kg/m} = 94.40 \text{ kg.}$</p> <p>Total = 180.95 kg</p> <p>Add wastage @ 5% = 9.05 kg.</p> <p>Total = 190.00kg or 1.90 q</p>	quintal	0.53	4600.00	2438.00
1010	<p>Mild steel plates</p> <p>(iv) 16mm dia. 50 mm long rivets = 56 Nos.+</p> <p>Add wastage @ 5 % = 2.8 Nos.</p> <p>Total = 58.8 Nos.</p>	quintal	1.9	4800.00	9120.00

1020	Mild steel rivets (v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	Carriage of Steel Carriage of steel (0.160+0.053+0.091+0.099+0.007+0.005) = 0.415 tonne LABOUR:	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40
0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron 9.5 x 0.4 = 3.80 sqm. + Struts 2.70 x 0.16 = 0.43 sqm. + Ties 5.4x0.124 = 0.67 sqm. + Braces 2 x 1.84 x 0.12 = 0.44 sqm. + Ties 2.8x0.12 = 0.34 sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number 13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

Add Water Charges @ 1% except on A ie on (30081.43-249.92=29831.51)				298.32
TOTAL				30379.75
Add CPOH @ 15% except on A ie on (30379.75-249.92=30129.83)				4519.47
TOTAL				34898.25

Cost of 395.0 kg	34898.25
Cost of 1 kg	88.35
Say	88.35

Cost index 35.59 %				31.44
Total with Cost index				119.79

22 Specification Code: od247921/2022_2023

**od247921/2022_2023 :Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangement and hand wheel fitted in well.
**

Code	Description	Unit	Quantity	Rate	Amount
MR	Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangement and hand wheel fitted in well. 	each	1.00000	248251.00	248251.00
TOTAL					248251.00
	cost for 1.1615 each				248251.00
	cost for one each				213733.10
	say				213733.10

Add Water Charges @ 1.0%				2137.33
Add CPOH @ 15.0%				32380.56
Cost index 35.59 %				0.00

	Total with Cost index				248251.0 0
	Say				248251.0 0

Grit/Screen Chamber 3m dia
1 Specification Code: 2.6.1

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89
TOTAL					1578.52
Cost of 10.0 cum					1578.52

Cost per cum	157.85
Say	157.85

Cost index 35.59 %	56.18
Total with Cost index	214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
TOTAL					675.50
Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

Cost index 35.59 %	27.92
Total with Cost index	106.37

3 Specification Code: od235529/2022_2023

od235529/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m

Quantity for 3.0m depth= $3.14 \times 1.95 \times 1.95 \times 3 = 35.82 \text{m}^3$

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%= $175.78 \times 1.01 \times 1.15 \times 1.3559 = 276.83$

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 $356.61 \times 1.3559 = 483.52$	cum	35.82000	483.52	17319.69
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					27835.74
	cost for 3.0 metre				27835.74
	cost for one metre				9278.58
	say				9278.58

	Add Water Charges @ 1.0%				92.78
	Add CPOH @ 15.0%				1405.70
	Cost index 35.59 %				82.67
	Total with Cost index				10859.75
	Say				10859.75

4 Specification Code: od235532/2022_2023

od235532/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m

Quantity for 3.0m depth= $3.14 \times 1.95 \times 1.95 \times 3 = 35.82 \text{m}^3$

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%= $175.78 \times 1.01 \times 1.15 \times 1.3559 = 276.83$

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 $389.02.19 \times 1.3559 = 527.48$	cum	35.82000	527.48	18894.33
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					29410.38
	cost for 3.0 metre				29410.38
	cost for one metre				9803.46
	say				9803.46

	Add Water Charges @ 1.0%				98.03
	Add CPOH @ 15.0%				1485.22
	Cost index 35.59 %				82.67
	Total with Cost index				11469.39
	Say				11469.39

5 Specification Code: od235536/2022_2023

od235536/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m

Quantity for 3.0m depth= $3.14 \times 1.95 \times 1.95 \times 3 = 35.82 \text{m}^3$

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%= $175.78 \times 1.01 \times 1.15 \times 1.3559 = 276.83$

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.4 $421.44 \times 1.3559 =$	cum	35.82000	571.43	20468.62
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					30984.67
	cost for 3.0 metre				30984.67
	cost for one metre				10328.22
	say				10328.22

	Add Water Charges @ 1.0%				103.28
	Add CPOH @ 15.0%				1564.72
	Cost index 35.59 %				82.67
	Total with Cost index				12078.90
	Say				12078.90

6 Specification Code: od235879/2022_2023

od235879/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)

Quantity for 3.0m depth= $3.14 \times 2.1 \times 2.1 \times 3 = 41.5422 \text{m}^3$

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%= $175.78 \times 1.01 \times 1.15 \times 1.3559 = 276.83$

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) $545.99 \times 1.3559 = 740.307$	cum	41.54220	740.31	30753.98
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	41.54220	276.83	11500.13
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					42854.11
	cost for 3.0 metre				42854.11
	cost for one metre				14284.70
	say				14284.70

	Add Water Charges @ 1.0%				142.84
	Add CPOH @ 15.0%				2164.13
	Cost index 35.59 %				82.67
	Total with Cost index				16674.35
	Say				16674.35

7 Specification Code: 5.9.12

SUBHEAD : 5.0**REINFORCED CEMENT CONCRETE****5.9** Centering and shuttering including strutting, etc. and removal of form for:**5.9.12** Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood $26.39 \times 0.038 = 1.00$ cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = $1200/8 = 150$ cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712$ cum Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798$ cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = $0.1586/8 = 0.0198$ cum	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = $53/8 = 6.625$ m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material $(P+Q+R)/6 = (3750.00+0.50+245.12/6)$	metre	6.625	40.00	265.00(R)
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Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations

Cost index	35.59 %		65.54
Total with Cost index			249.69

8 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1

All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00
TOTAL					5977.32

Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

Cost index 35.59 %	2470.89
Total with Cost index	9413.54

9 Specification Code: 5.33.2

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2

All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20

0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level $0.75 \times 2.5 = 1.88$	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL	7026.36
Add Water Charges @ 1%	70.26
TOTAL	7096.62
Add CPOH @ 15%	1064.49
TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

	Cost index 35.59 %				2904.54
	Total with Cost index				11065.64

10 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

11 Specification Code: od235539/2022_2023

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od235539/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

12 Specification Code: 4.1.3

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.3 1:2:4 (cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				

0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.67	1350.00	904.50
0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.22	1350.00	297.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.89	103.77	92.36
0982	Coarse sand (zone III)	cum	0.445	1350.00	600.75
2203	Carriage of Coarse sand	cum	0.445	103.77	46.18
0367	Portland Cement (0.2225 cum)	tonne	0.32	4940.00	1580.80
2209	Carriage of Cement	tonne	0.32	92.24	29.52
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

TOTAL				5073.95
Add Water Charges @ 1%				50.74
TOTAL				5124.69
Add CPOH @ 15%				768.70
TOTAL				5893.39
Cost of 1.0 cum				5893.39
Say				5893.4

Cost index		35.59 %			2097.46
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	Total with Cost index				7990.86
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13 Specification Code: 10.1

SUBHEAD : 10.0

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				
1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34
AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)					63.17
TOTAL					6512.45

AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)	957.07
TOTAL	7470.00
Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

Cost index	35.59 %				26.59
Total with Cost index					101.29

14 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31

2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL				4578.85
Add Water Charges @ 1%				45.79
TOTAL				4624.64
Add CPOH @ 15%				693.70
TOTAL				5318.34
Cost of 1.0 cum				5318.34
Say				5318.35

Cost index 35.59 %					1892.80
Total with Cost index					7211.15

15 Specification Code: 5.22.5

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.5

Hard drawn steel wire fabric

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Hard drawn steel wire fabric 100kg/7.75 kg = 12.903 sqm Wastage 5% = 0.64 sqm Total = 13.548 sqm				
1021	Hard drawn steel wire fabric	sqm	13.548	430.00	5825.64
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For cutting and laying in position	L.S	26.0	2.00	52.00
0103	Blacksmith 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	1.5	558.00	837.00
9999	Sundries-and binding wire	L.S	13.52	2.00	27.04
TOTAL					6887.17
Add Water Charges @ 1%					68.87
TOTAL					6956.04
Add CPOH @ 15%					1043.41
TOTAL					7999.45
Cost of 100.0 kilogram					7999.45
Cost per kilogram					79.99
Say					80.0

	Cost index 35.59 %				28.47
	Total with Cost index				108.47

16 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25

Cost of 10.0 sqm	1647.25
Cost per sqm	164.72
Say	164.7

Cost index 35.59 %	58.62
Total with Cost index	223.32

17 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95
Cost per cum					190.69
Say					190.7

Cost index 35.59 %	67.87
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	Total with Cost index				258.57
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18 Specification Code: 19.16

SUBHEAD : 19.0

DRAINAGE

19.16

Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foot rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number 4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) 1st class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90

AddWater Charges @ 1% except on A ie on (354.8-62.7=292.1)	2.92
TOTAL	357.72
AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)	44.25
TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

Cost index 35.59 %	143.05
Total with Cost index	545.00

19 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whitening

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46

TOTAL	287.76
Add Water Charges @ 1%	2.88
TOTAL	290.64
Add CPOH @ 15%	43.60
TOTAL	334.24
Cost of 10.0 sqm	334.24
Cost per sqm	33.42
Say	33.4

Cost index 35.59 %	11.89
Total with Cost index	45.29

20 Specification Code: 10.2

SUBHEAD : 10.0

Other Engineering Organisations

STEEL WORK

10.2

Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				

1007	<p>Structural steel such as tees, angles, channels and R.S. joists</p> <p>(ii) Tiles (flats) 50x12mm: $2 \times 2.7 = 5.4 \text{ m @ } 4.7 \text{ kg/m} = 25.38\text{kg}+$</p> <p>Ties central (flats): $50 \times 10\text{mm } 1 \times 2.80 = 2.8 \text{ m @ } 3.90 \text{ kg/m} = 10.92\text{kg}+$</p> <p>Braces (flats) 40x 10 mm: $2 \times 1.84 = 3.68\text{m @ } 3.9 \text{ kg/m} = 14.35 \text{ kg.}$</p> <p>Total = 50.65 kg+</p> <p>Add wastage @ 5% = 2.53kg</p> <p>Total = 53.18kg. = 0.53 qtl</p>	quintal	1.6	4600.00	7360.00
1009	<p>Flats exceeding 10 mm in thickness</p> <p>(iii) Gusset plates 10 mm thick: $1 \times 0.74 \times 0.35\text{m} = 0.259 \text{ sqm.}+$</p> <p>Shone $4 \times 0.46 \times 0.46 = 0.845 \text{ sqm.}$</p> <p>Total = 1.104 sqm.</p> <p>$1.104 \text{ sqm @ } 78.4 \text{ kg/m} = 86.55 \text{ kg}$</p> <p>12 mm plates at the point of principal rafter and strut: $2 \times 0.3 \times 0.2 = 0.12 \text{ sqm.} +$</p> <p>Tie beam, brace and strut: $2 \times 0.5 \times 0.3 = 0.30 \text{ sqm.} +$</p> <p>Sole plates: $2 \times 0.46 \times 0.46 = 0.42 \text{ sqm.}+$</p> <p>Anchor plate: $2 \times 0.46 \times 0.1 = 0.09\text{sqm.}$</p> <p>Total = 0.93 sqm. Say 1.00 sqm.</p> <p>$1.00 \text{ sqm. @ } 94.4 \text{ kg/m} = 94.40 \text{ kg.}$</p> <p>Total = 180.95 kg</p> <p>Add wastage @ 5% = 9.05 kg.</p> <p>Total = 190.00kg or 1.90 q</p>	quintal	0.53	4600.00	2438.00
1010	<p>Mild steel plates</p> <p>(iv) 16mm dia. 50 mm long rivets = 56 Nos.+</p> <p>Add wastage @ 5 % = 2.8 Nos.</p> <p>Total = 58.8 Nos.</p>	quintal	1.9	4800.00	9120.00

1020	Mild steel rivets (v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	Carriage of Steel Carriage of steel (0.160+0.053+0.091+0.099+0.007+0.005) = 0.415 tonne LABOUR:	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40
0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron 9.5 x 0.4 = 3.80 sqm. + Struts 2.70 x 0.16 = 0.43 sqm. + Ties 5.4x0.124 = 0.67 sqm. + Braces 2 x 1.84 x 0.12 = 0.44 sqm. + Ties 2.8x0.12 = 0.34 sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number 13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

Add Water Charges @ 1% except on A ie on (30081.43-249.92=29831.51)				298.32
TOTAL				30379.75
Add CPOH @ 15% except on A ie on (30379.75-249.92=30129.83)				4519.47
TOTAL				34898.25

Cost of 395.0 kg	34898.25
Cost of 1 kg	88.35
Say	88.35

Cost index 35.59 %				31.44
Total with Cost index				119.79

21 Specification Code: od247921/2022_2023

**od247921/2022_2023 :Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangement and hand wheel fitted in well.
**

Code	Description	Unit	Quantity	Rate	Amount
MR	Supply and erection of Cast Iron single faced manually operated rising type 500mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangement and hand wheel fitted in well. 	each	1.00000	248251.00	248251.00
TOTAL					248251.00
	cost for 1.1615 each				248251.00
	cost for one each				213733.10
	say				213733.10

Add Water Charges @ 1.0%				2137.33
Add CPOH @ 15.0%				32380.56
Cost index 35.59 %				0.00

	Total with Cost index				248251.0 0
	Say				248251.0 0

Silt Pit 1.5mx1.5mx1.2m
1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89
TOTAL					1578.52
Cost of 10.0 cum					1578.52

Cost per cum	157.85
Say	157.85

Cost index 35.59 %	56.18
Total with Cost index	214.03

2 Specification Code: 2.26.1

2.26

Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
TOTAL					675.50
Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

Cost index 35.59 %	27.92
Total with Cost index	106.37

3 Specification Code: 2.27

2.27

Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
TOTAL					14597.33
Add Water Charges @ 1%					145.97
TOTAL					14743.30
Add CPOH @ 15%					2211.49
TOTAL					16954.79
Cost of 10.0 cum					16954.79
Cost per cum					1695.48
Say					1695.5

	Cost index 35.59 %				603.43
	Total with Cost index				2298.93

4 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04
TOTAL					4578.85

Add Water Charges @ 1%	45.79
TOTAL	4624.64
Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

Cost index 35.59 %	1892.80
Total with Cost index	7211.15

5 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20

0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL				5977.32
Add Water Charges @ 1%				59.77
TOTAL				6037.09
Add CPOH @ 15%				905.56
TOTAL				6942.65
Cost of 1.0 cum				6942.65
Say				6942.65

	Cost index	35.59 %			2470.89
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	Total with Cost index				9413.54
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6 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

7 Specification Code: od235539/2022_2023

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od235539/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

8 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				

1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL					6241.51
Add Water Charges @ 1%					62.42
TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52
Cost per kilogram					72.50
Say					72.5

Cost index 35.59 %					25.80
Total with Cost index					98.30

9 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
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	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25
Cost of 10.0 sqm					1647.25
Cost per sqm					164.72
Say					164.7

	Cost index 35.59 %				58.62
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	Total with Cost index				223.32
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10 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood $26.39 \times 0.038 = 1.00$ cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = $1200/8 = 150$ cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 =$ 0.0712 cum Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 =$ 0.0798 cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = $0.1586/8 = 0.0198$ cum	10 cud m	150.0	260.00	3900.00(P)

1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = 53/8 = 6.625 m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%					41.66
TOTAL					4207.17
Add CPOH @ 15%					631.07
TOTAL					4859.72
Cost of 26.39 sqm					4859.72
Cost of 1 sqm					184.15
Say					184.15

Cost index 35.59 %					65.54
Total with Cost index					249.69

11 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40

0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40

TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95
Cost per cum					190.69
Say					190.7

Cost index 35.59 %					67.87
Total with Cost index					258.57

Other Engineering Organisations

Valve chamber 2.3mx3.8mx1.9m

1 Specification Code: 2.6.1

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00

0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60

TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89
TOTAL					1578.52
Cost of 10.0 cum					1578.52
Cost per cum					157.85
Say					157.85

	Cost index 35.59 %				56.18
	Total with Cost index				214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
TOTAL					675.50

Add Water Charges @ 1%	6.75
TOTAL	682.25
Add CPOH @ 15%	102.34
TOTAL	784.59
Cost of 10.0 cum	784.59
Cost per cum	78.46
Say	78.45

Cost index 35.59 %	27.92
Total with Cost index	106.37

3 Specification Code: 2.27

2.27

Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Other Engineering Organisations

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
TOTAL					14597.33
Add Water Charges @ 1%					145.97
TOTAL					14743.30
Add CPOH @ 15%					2211.49

TOTAL	16954.79
Cost of 10.0 cum	16954.79
Cost per cum	1695.48
Say	1695.5

Cost index 35.59 %	603.43
Total with Cost index	2298.93

4 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50

2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

	TOTAL	4578.85
	Add Water Charges @ 1%	45.79
	TOTAL	4624.64
	Add CPOH @ 15%	693.70
	TOTAL	5318.34
	Cost of 1.0 cum	5318.34
	Say	5318.35

	Cost index 35.59 %				1892.80
	Total with Cost index				7211.15

5 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content

considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30

0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL					5977.32
Add Water Charges @ 1%					59.77
TOTAL					6037.09
Add CPOH @ 15%					905.56
TOTAL					6942.65
Cost of 1.0 cum					6942.65
Say					6942.65

Cost index 35.59 %					2470.89
Total with Cost index					9413.54

6 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80

TOTAL	52.12
Add Water Charges @ 1%	.52
TOTAL	52.64
Add CPOH @ 15%	7.90
TOTAL	60.54
Cost of 1.0 cum	60.54
Say	60.55

Cost index 35.59 %	21.55
Total with Cost index	82.10

7 Specification Code: 5.22.6

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6

Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in position	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00

9999	Sundries-	L.S	26.91	2.00	53.82
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TOTAL					6241.51
Add Water Charges @ 1%					62.42
TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52
Cost per kilogram					72.50
Say					72.5

	Cost index	35.59 %			25.80
	Total with Cost index				98.30

8 Specification Code: 5.9.12

Other Engineering Organisations

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
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	<p>Details of cost for 26.39 sqm</p> <p>Surface area</p> <p>Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm</p> <p>MATERIAL:</p> <p>Assuming that the timber will become unserviceable after being used 8 times</p> <p>planks 38 mm (Second class kail wood</p> <p>$26.39 \times 0.038 = 1.00$ cum</p> <p>Wastage 2% = 0.20 cum.</p> <p>Total = 1.20 cum . or 1200 cudm.</p> <p>Qty for cost using once = $1200/8 = 150$ cudm</p>				
1198	<p>Second class kail wood in planks</p> <p>2nd class kail wood battens</p> <p>Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712$ cum</p> <p>Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798$ cum</p> <p>Total = 0.1510 cum.</p> <p>Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm</p> <p>Qty for cost using once = $0.1586/8 = 0.0198$ cum</p>	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)
0302	<p>Safeda ballies 125 mm diameter</p> <p>Inside $25 \times 1.00 = 25.00$ m</p> <p>Outside $28 \times 1.00 = 28.00$ m</p> <p>Total = 53.00 m</p> <p>Qty for cost using once = $53/8 = 6.625$ m</p> <p>Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material</p> <p>$(P+Q+R)/6 = (3750.00+0.50+245.12/6)$</p>	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Cost index	35.59 %				65.54
Total with Cost index					249.69

9 Specification Code: 5.9.16.1

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.16 Edges of slabs and breaks in floors and walls

5.9.16.1 Under 20 cm wide

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a 3mx3m slab 15cms thick 12m edge Length MATERIAL: Assuming that the timber will become unserviceable after being used 8 times				
1198	Second class kail wood in planks (i) Planks 30 mm thick (2nd class Kail wood or equivalent local soft wood) $4 \times 3 \times 0.15 \times 0.030 = 0.54 \text{ cum}$ Wastage @ 5% = 0.003 cum. Total = 0.057 cum 57 cudm Qty taken for cost of using once = $57/8 = 7.125 \text{ cudm}$	10 cud m	7.125	260.00	185.25

1197	Second class kail wood in scantling (ii) Battens 75 mm x 100 mm (2nd class Kail wood) Horizontal $2 \times 4 \times 0.075 \times 0.1 \times 0.5 = 0.030$ Horizontal $2 \times 4 \times 0.075 \times 0.1 \times 1.5 = 0.090$ (iii) Vertical battens $16 \times 0.15 \times 0.075 \times 0.030 \text{ m} = 0.0054$ (iv) Struts $16 \times 0.25 \times 0.07 \times 0.075 = 0.0225$ Total = 0.1479 Wastage @ 5% = 0.0074 Total = 0.1553 cum = 155 cudm Qty taken for cost of using once = $155/8 = 19.375$ cudm	10 cudm	19.375	260.00	503.75
2204	Carriage of Timber Planks = 0.057 cum. Battens = 0.057 cum. Total = 0.212 cum. Qty taken for cost of using once = $0.212/8 = 0.0265$ cum LABOUR: For assembling erection dismantling & cleaning	cum	0.0265	118.59	3.14
0112	Carpenter 2nd class	Day	0.81	679.00	549.99
0114	Beldar	Day	0.54	558.00	301.32
9999	Sundries-	L.S	5.2	2.00	10.40

TOTAL	1553.85
Add Water Charges @ 1%	15.54
TOTAL	1569.39
Add CPOH @ 15%	235.41
TOTAL	1804.80
Cost of 12.0 metre	1804.80
Cost per metre	150.40
Say	150.4

	Cost index 35.59 %				53.53
	Total with Cost index				203.93

10 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95
Cost per cum					190.69
Say					190.7

	Cost index 35.59 %				67.87
	Total with Cost index				258.57

11 Specification Code: 19.16

SUBHEAD : 19.0**DRAINAGE****19.16**

Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foot rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number 4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) 1st class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
Add Water Charges @ 1% except on A ie on (354.8-62.7=292.1)					2.92
TOTAL					357.72

AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)	44.25
TOTAL	401.95
Cost of 1.0 each	401.95
Cost of 1 each	401.95
Say	401.95

Cost index 35.59 %	143.05
Total with Cost index	545.00

Pump sets
1 Specification Code: od236188/2022_2023

od236188/2022_2023 :Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 20 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years

MR for Submercible pumpset -Av Rs. 18135 (based on KWA estimate approved rates)

Hence for 20HP pump= 20hp@Rs.18135=RS. 362700

Code	Description	Unit	Quantity	Rate	Amount
MR	20hp pumpset	each set	1.00000	362700.00	362700.00
TOTAL					362700.00
cost for one each set					362700.00
	say				362700.00

Add Water Charges @ 1.0%	3627.00
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	Add CPOH @ 15.0%				54949.05
	Cost index 35.59 %				0.00
	Total with Cost index				421276.05
	Say				421276.05

2 Specification Code: od236193/2022_2023

od236193/2022_2023 :Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 15 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years

MR for Submercible pumpset -Av Rs. 18135 (based on KWA estimate approved rates)

Hence for 15HP pump= 15hp@Rs.18135=RS. 272025

Code	Description	Unit	Quantity	Rate	Amount
MR	15hp pumpset	each set	1.00000	272025.00	272025.00
TOTAL					272025.00
cost for one each set					272025.00
	say				272025.00

	Add Water Charges @ 1.0%				2720.25
	Add CPOH @ 15.0%				41211.78

	Cost index 35.59 %				0.00
	Total with Cost index				315957.04
	Say				315957.04

3 Specification Code: od236240/2022_2023

od236240/2022_2023 :Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 5 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years

MR for Submercible pumpset -Av Rs. 18135 (based on KWA estimate approved rates)

Hence for 5HP pump= 5hp@Rs.18135=RS. 90675

Code	Description	Unit	Quantity	Rate	Amount
MR	5HP pumpset	each set	1.00000	90675.00	90675.00
TOTAL					90675.00
cost for one each set					90675.00
	say				90675.00

	Add Water Charges @ 1.0%				906.75
	Add CPOH @ 15.0%				13737.26
	Cost index 35.59 %				0.00
	Total with Cost index				105319.01
	Say				105319.01

Construction of pump room

1 Specification Code: od248172/2022_2023

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od248172/2022_2023 :RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in column and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in verified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty. The sanitary/Plumping and Electrical works are followed by standard specifications.

Code	Description	Unit	Quantity	Rate	Amount
MR	RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved quality. The foundation are also in column and framed structure with load bearing rcc pillars of standard size. Stepped footing or Mat or Raft foundation as per soil condition. The walls are in solid cement masonry have at least 25cm wall thickness. The floors are in verified tile finish. Walls are finished with two coat emulsion finish over two coat primer and RCC Roofed building with required opening of Doors and Windows in any hard wood such as teak or same approved acrylic wall putty. The sanitary/Plumping and Electrical works are followed by standard specifications. Plinth area Rates 2012 CPWD	sqm	1.00000	19000.00	19000.00
MR	Add 60% cost Index for 2012 items	sqm	0.60000	19000.00	11400.00
TOTAL					30400.00
cost for one sqm					30400.00
	say				30400.00

	Add Water Charges @ 1.0%				304.00
	Add CPOH @ 15.0%				4605.60
	Cost index 35.59 %				0.00

	Total with Cost index				35309.60
	Say				35309.60

Construction of Column & Erection of ISMB
1 Specification Code: 5.33.2

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2

All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44

7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level $0.75 \times 2.5 = 1.88$	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL				7026.36
Add Water Charges @ 1%				70.26
TOTAL				7096.62
Add CPOH @ 15%				1064.49
TOTAL				8161.11
Cost of 1.0 cum				8161.11
Say				8161.1

	Cost index 35.59 %				2904.54
	Total with Cost index				11065.64

2 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

3 Specification Code: od249222/2022_2023

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od249222/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Other Engineering Organisations Say				1916.05

4 Specification Code: 5.9.6

5.9 Centering and shuttering including strutting, etc. and removal of form for:**5.9.6** Columns, Pillars, Piers, Abutments, Posts and Struts

Code	Description	Unit	Quantity	Rate	Amount
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	<p>Details of cost for 4.5 sqm.</p> <p>Size of column 450x450mm and 2.5 m high</p> <p>Area of contact = $4 \times 0.45 \times 2.5 = 4.5$ sqm</p> <p>MATERIAL: Assuming shuttering will become unserviceable after use of 40 times</p> <p>Add maintenance charges @ 10 % of cost of material</p> <p>Less salvage value of material after full use @ 25% of cost of material</p>				
7331	<p>Wall form panel 1250x450xmm</p> <p>Qty taken for cost of using once = $8 \times 0.85 / 40 = 0.17$</p>	each	0.17	860.00	146.20
7332	<p>Corner angle 45x45x5 mm 2.50 long</p> <p>Qty taken for cost of using once = $4 \times 0.85 / 40 = 0.085$</p>	each	0.085	255.00	21.68
7333	<p>Column clamp 450x1070 mm</p> <p>Qty taken for cost of using once = $5 \times 0.85 / 40 = 0.1063$</p>	each	0.1063	965.00	102.58
7334	<p>Prop 2 m (2-3.5m)</p> <p>Qty taken for cost of using once = $4 \times 0.85 / 40 = 0.085$</p>	each	0.085	635.00	53.98
9999	Sundries-Qty taken for cost of using once = $1300 \times 0.85 / 40 = 27.62$	L.S	27.62	2.00	55.24
9977	Carriage LABOUR	L.S	52.0	2.00	104.00
0116	Fitter(grade1)	Day	1.0	738.00	738.00
0114	Beldar	Day	2.0	558.00	1116.00
9999	Sundries-Shuttering oil	L.S	39.0	2.00	78.00
9999	Sundries-Carriage	L.S	26.0	2.00	52.00

TOTAL				2467.68
Add Water Charges @ 1%				24.68
TOTAL				2492.36

Add CPOH @ 15%	373.85
TOTAL	2866.21
Cost of 4.5 sqm	2866.21
Cost per sqm	636.94
Say	636.95

Cost index	35.59 %				226.69
Total with Cost index					863.64

5 Specification Code: 5.22.6

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6

Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in position	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
TOTAL					6241.51

Add Water Charges @ 1%	62.42
TOTAL	6303.93
Add CPOH @ 15%	945.59
TOTAL	7249.52
Cost of 100.0 kilogram	7249.52
Cost per kilogram	72.50
Say	72.5

Cost index 35.59 %	25.80
Total with Cost index	98.30

6 Specification Code: 13.52.1

Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52

13.52.1

On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32

7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25
Cost of 10.0 sqm					1647.25
Cost per sqm					164.72
Say					164.7

Cost index 35.59 %					58.62
Total with Cost index					223.32

7 Specification Code: 13.7.1					
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13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				

3.3	Rate as per item Number3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL					2547.60
Add Water Charges @ 1%					25.48
TOTAL					2573.08
Add CPOH @ 15%					385.96
TOTAL					2959.04
Cost of 10.0 sqm					2959.04
Cost per sqm					295.90
Say					295.9

	Cost index 35.59 %				105.31
	Total with Cost index				401.21

8 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whitening

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46
TOTAL					287.76
Add Water Charges @ 1%					2.88
TOTAL					290.64
Add CPOH @ 15%					43.60
TOTAL					334.24
Cost of 10.0 sqm					334.24
Cost per sqm					33.42
Say					33.4

	Cost index 35.59 %				11.89
	Total with Cost index				45.29

9 Specification Code: 10.2

SUBHEAD : 10.0

STEEL WORK

10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and

framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				
1007	Structural steel such as tees, angles, channels and R.S. joists (ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+ Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+ Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg. Total = 50.65 kg+ Add wastage @ 5% = 2.53kg Total = 53.18kg. = 0.53 qtl	quintal	1.6	4600.00	7360.00

1009	<p>Flats exceeding 10 mm in thickness</p> <p>(iii) Gusset plates 10 mm thick: $1 \times 0.74 \times 0.35 \text{m} = 0.259 \text{ sqm.} +$ Shone $4 \times 0.46 \times 0.46 = 0.845 \text{ sqm.}$ Total = 1.104 sqm. $1.104 \text{ sqm} @ 78.4 \text{ kg/m} = 86.55 \text{ kg}$ 12 mm plates at the point of principal rafter and strut: $2 \times 0.3 \times 0.2 = 0.12 \text{ sqm.} +$ Tie beam, brace and strut: $2 \times 0.5 \times 0.3 = 0.30 \text{ sqm.} +$ Sole plates: $2 \times 0.46 \times 0.46 = 0.42 \text{ sqm.} +$ Anchor plate: $2 \times 0.46 \times 0.1 = 0.09 \text{ sqm.}$ Total = 0.93 sqm. Say 1.00 sqm. $1.00 \text{ sqm.} @ 94.4 \text{ kg/m} = 94.40 \text{ kg.}$ Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00 kg or 1.90 q</p>	quintal	0.53	4600.00	2438.00
1010	<p>Mild steel plates</p> <p>(iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.</p>	quintal	1.9	4800.00	9120.00
1020	<p>Mild steel rivets</p> <p>(v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm</p>	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	<p>Carriage of Steel</p> <p>Carriage of steel $(0.160 + 0.053 + 0.091 + 0.099 + 0.007 + 0.005) =$ 0.415 tonne LABOUR:</p>	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40

0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron $9.5 \times 0.4 = 3.80$ sqm. + Struts $2.70 \times 0.16 = 0.43$ sqm. + Ties $5.4 \times 0.124 = 0.67$ sqm. + Braces $2 \times 1.84 \times 0.12 = 0.44$ sqm. + Ties $2.8 \times 0.12 = 0.34$ sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number 13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

Add Water Charges @ 1% except on A ie on (30081.43-249.92=29831.51)				298.32
TOTAL				30379.75
Add CPOH @ 15% except on A ie on (30379.75-249.92=30129.83)				4519.47
TOTAL				34898.25
Cost of 395.0 kg				34898.25
Cost of 1 kg				88.35
Say				88.35

	Cost index 35.59 %				31.44
	Total with Cost index				119.79

10 Specification Code: od249403/2022_2023

od249403/2022_2023 :Charges for chain pulley block with travelling trolley of 2 Tonne capacity

Code	Description	Unit	Quantity	Rate	Amount
MR	Pulley Block - 2 Tonne	each	1.00000	14201.00	14201.00
MR	Extra length	metre	6.00000	735.00	4410.00
TOTAL					18611.00
	cost for 1.1615 each				18611.00
	cost for one each				16023.25
	say				16023.25

	Add Water Charges @ 1.0%				160.23
	Add CPOH @ 15.0%				2427.52
	Cost index 35.59 %				0.00
	Total with Cost index				18611.00
	Other Engineering Say Organisations				18611.00

PRICE

KIIFB-IURWTS Project- Construction of compound wall and garden works for Wet well

General Abstract

(Dsor year: **2018**, Cost Index Applied for this estimate is **35.59%**)

SI No	Heading Description	Amount
1	Compound wall for Pumping station	1651156.05
2	Gardening/Green belt	16375.66
3	Paver works	76179.64
4	Cost for supply and plantation of Shrubs and Creepers	17983.00
Provision for GST payments (in %) @		0.0%
Amount reserved for GST payments		0.00
Total		1761694.00
Lumpsum for round off		306.00
		TOTAL Rs 1762000.00
		Rounded Total Rs 17,62,000
		Rupees Seventeen Lakh Sixty Two Thousand Only

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations

PRICE

KIIFB-IURWTS Project- Construction of compound wall and garden works for Wet well

Abstract Estimate

(Dsr year: **2018**, Cost Index Applied for this estimate is **35.59%**)

1 Compound wall for Pumping station		
1	2.31 Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50 m outside the periphery of the area cleared	
Net Total Quantity		520.000 sqm
Say 520.000 sqm @ Rs 14.78 / sqm		Rs 7685.60
2	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed. All kinds of soil	
Net Total Quantity		277.408 cum
Say 277.408 cum @ Rs 214.03 / cum		Rs 59373.63
3	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. All kinds of soil	
Net Total Quantity		23.805 cum
Say 23.805 cum @ Rs 106.37 / cum		Rs 2532.14
4	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		247.773 cum
Say 247.773 cum @ Rs 258.57 / cum		Rs 64066.66
5	od246903/2022_2023 Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge	
Net Total Quantity		26.405 cum
Say 26.405 cum @ Rs 2548.23 / cum		Rs 67286.01
6	4.1.5 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level: 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)	

Net Total Quantity		10.404 cum
Say 10.404 cum @ Rs 7367.55 / cum		Rs 76651.99
7	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work upto plinth level	
Net Total Quantity		21.033 cum
Say 21.033 cum @ Rs 9413.54 / cum		Rs 197994.99
8	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work above plinth level upto floor V level	
Net Total Quantity		4.761 cum
Say 4.761 cum @ Rs 11065.64 / cum		Rs 52683.51
9	5.9.1 Centering and shuttering including strutting, etc. and removal of form for: Foundations, footings, bases of columns, etc for mass concrete	
Net Total Quantity		59.131 sqm
Say 59.131 sqm @ Rs 335.31 / sqm		Rs 19827.22
10	5.9.5 Centering and shuttering including strutting, etc. and removal of form for: Lintels, beams, plinth beams, girders bressumers and cantilevers	
Net Total Quantity		57.266 sqm
Say 57.266 sqm @ Rs 649.82 / sqm		Rs 37212.59
11	5.9.6 Centering and shuttering including strutting, etc. and removal of form for: Columns, Pillars, Piers, Abutments, Posts and Struts	
Net Total Quantity		82.801 sqm
Say 82.801 sqm @ Rs 863.64 / sqm		Rs 71510.26

12	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		2579.400 kilogram
Say 2579.400 kilogram @ Rs 98.30 / kilogram		Rs 253555.02
13	6.4.2 Brick work with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in superstructure above plinth level up to floor V level in all shapes and sizes in:Cement mortar 1:6 (1 cement : 6 coarse sand)	
Net Total Quantity		43.327 cum
Say 43.327 cum @ Rs 8934.70 / cum		Rs 387113.75
14	13.11 18 mm cement plaster in two coats under layer 12 mm thick cement plaster 1:5 (1 cement : 5 coarse sand) finished with a top layer 6 mm thick cement plaster 1:6 (1 cement : 6 fine sand).	
Net Total Quantity		483.697 sqm
Say 483.697 sqm @ Rs 470.02 / sqm		Rs 227347.26
15	13.37.1 White washing with lime to give an even shade:New work (three or more coats)	
Net Total Quantity		483.697 sqm
Say 483.697 sqm @ Rs 33.63 / sqm		Rs 16266.73
16	13.98.1 Wall painting with plastic emulsion paint of approved brand and manufactureto give an even shade:One or more coats on old work	
Net Total Quantity		11.875 sqm
Say 11.875 sqm @ Rs 99.66 / sqm		Rs 1183.46
17	od248650/2022_2023 Supplying and fabricating and erection of iron gate with of required size as per direction at site with G.I pipes of 50 mm and specials at all sides GI pipes rates taken separately)and 40x40x6mm angles as bracing on which 2 No.of m.s sheet of 16 gauge of size 2x2m each is welded as two halves fixing letter "KMRL' including one coat of primer with red lead etc.compete as directed. Gate 2 Nos (1 Main gate of 4mx2m and a wicket gate 1.2m x 2m)	
Net Total Quantity		386.591 kilogram
Say 386.591 kilogram @ Rs 101.28 / kilogram		Rs 39153.94
18	od248629/2022_2023 Supplying and fabricating GI pipes of 50mm dia and suitable specials for outer frame of Iron gate as per direction at site including applying priming coat of approves steel primer	
Net Total Quantity		112.321 kg
Say 112.321 kg @ Rs 126.05 / kg		Rs 14158.06

19	od249463/2022_2023 Supplying and fixing barbed wire fencing over the proposed compound wall with 'L' angle iron 50 x 50 x 6mm & 1.45m posts bent to shape at 2.5m centres with 6 rows of barbed wire and also in a zig zag manner at 25cm c.c. connecting all the rows with barbed wire will be of 2 ply and 12 gauge or other approved size including drilling hole in 'L' iron posts and fixing the posts in cement concrete 1:2:4 of size 15x15x45cm etc as directed.	
Net Total Quantity		82.200 metre
Say 82.200 metre @ Rs 675.83 / metre		Rs 55553.23
2 Gardening/Green belt		
1	30.2.14.4 Digging holes in ordinary soil and refilling the same with the excavated earth mixed with manure or sludge in the ratio of 2:1 by volume (2 parts of stacked volume of earth after reduction by 20% : 1 part of stacked volume of manure after reduction by 8%) flooding with water, dressing including removal of rubbish and surplus earth, if any, with all leads and lifts (cost of manure, sludge or extra good earth if needed to be paid for separately) :Holes 45 cm dia, and 45 cm deep	
Net Total Quantity		76.000 holes
Say 76.000 holes @ Rs 23.59 / holes		Rs 1792.84
2	od247488/2022_2023 Providing and fixing planting plants and shrubs on compound wall as directed 	
Net Total Quantity		83.000 RM
Say 83.000 RM @ Rs 169.22 / RM		Rs 14045.26
3	30.2.57.1 Plantation of Trees, Shrubs, and Hedge at site i/c watering and removal of unsaverieable material?s as per direction of officer in charge (excluding cast of plant & water)Cost of plantation per trees plants (for 100 nos.=427.45/100)	
Net Total Quantity		46.000 no
Say 46.000 no @ Rs 8.81 / no		Rs 405.26
4	30.2.57.2 Plantation of Trees, Shrubs, and Hedge at site i/c watering and removal of unsaverieable material?s as per direction of officer in charge (excluding cast of plant & water)Cost of plantation per Shrubs plants (for 200 nos.=427.45/200)	
Net Total Quantity		30.000 no
Say 30.000 no @ Rs 4.41 / no		Rs 132.30
3 Paver works		
1	16.1 Preparation and consolidation of sub grade with power road roller of 8 to 12 tonne capacity after excavating earth to an average of 22.5 cm depth, dressing to camber and consolidating with road roller including making good the undulations etc. and re-rolling the sub grade and disposal of surplus earth with lead upto 50 metres.	

Net Total Quantity		50.000 sqm
Say 50.000 sqm @ Rs 184.54 / sqm		Rs 9227.00
2	16.2 Extra for compaction of earth work in embankment under optimum moisture conditions to give at least 95% of the maximum dry density (proctor density)	
Net Total Quantity		10.000 cum per km
Say 10.000 cum per km @ Rs 21.42 / cum per km		Rs 214.20
3	16.3.7 Supplying and stacking at site.Stone screening 11.2 mm nominal size (Type B)	
Net Total Quantity		5.000 cum
Say 5.000 cum @ Rs 2328.89 / cum		Rs 11644.45
4	16.4 Laying, spreading and compacting stone aggregate of specified sizes to WBM specifications in uniform thickness, hand picking, rolling with 3 wheeled road/ vibratory roller 8-10 tonne capacity in stages to proper grade and camber, applying and brooming requisite type of screening / binding material to fill up interstices of coarse aggregate, watering and compacting to the required density.	
Net Total Quantity		5.000 cum
Say 5.000 cum @ Rs 903.10 / cum		Rs 4515.50
5	16.68 Providing and laying 60 mm thick factory made cement concrete interlocking paver block of M - 30 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge.	
Net Total Quantity		50.000 sqm
Say 50.000 sqm @ Rs 1011.57 / sqm		Rs 50578.50
4 Cost for supply and plantation of Shrubs and Creepers		
Lump-Sum Total		Rs 17983.00
	Provision for GST payments (in %) @	0.0%
Amount reserved for GST payments		0.00
Total		1761694.00
Lumpsum for round off		306.00
TOTAL Rs 1762000.00		
Rounded Total Rs 17,62,000		
Rupees Seventeen Lakh Sixty Two Thousand Only		

(Cost Index Applied for this estimate is 35.59%)

KIIFB-IURWTS Project- Construction of compound wall and garden works for Wet well

Detailed Estimate

(Dsor year: **2018**, Cost Index Applied for this estimate is **35.59%**)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
1 Compound wall for Pumping station								
1	2.31 Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50 m outside the periphery of the area cleared							
		1	20.000	26.000			520.000	
							Total Quantity	520.000 sqm
							Total Deducted Quantity	0.000 sqm
							Net Total Quantity	520.000 sqm
							Say 520.000 sqm @ Rs 14.78 / sqm	Rs 7685.60
2	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed. All kinds of soil							
	For foundation	30	2.300	2.300	1.650		261.855	
	For beam	1	75.350	0.430	0.480		15.553	
							Total Quantity	277.408 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	277.408 cum
							Say 277.408 cum @ Rs 214.03 / cum	Rs 59373.63
3	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials. All kinds of soil							
	For foundation	30	2.300	2.300	0.150		23.805	
							Total Quantity	23.805 cum
							Total Deducted Quantity	0.000 cum
							Net Total Quantity	23.805 cum
							Say 23.805 cum @ Rs 106.37 / cum	Rs 2532.14
4	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m							

	and lift up to 1.5 m.							
		1	277.408				277.408	
	Volume of PCC	1	10.400				-10.400	
	Volume of foundation	1	13.500				-13.500	
	Volume of column	30	0.230	0.230	1.100		-1.745	
	Volume of beam	1	3.990				-3.990	
	Total Quantity						277.408 cum	
	Total Deducted Quantity						-29.635 cum	
	Net Total Quantity						247.773 cum	
	Say 247.773 cum @ Rs 258.57 / cum						Rs 64066.66	
5	od246903/2022_2023 Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge							
	Under foundation	30	2.300	2.300	0.150		23.805	
	Under beams	1	75.350	0.230	0.150		2.600	
	Total Quantity						26.405 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						26.405 cum	
	Say 26.405 cum @ Rs 2548.23 / cum						Rs 67286.01	
6	4.1.5 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)							
	For foundation	30	1.700	1.700	0.100		8.670	
	For Beam	1	75.350	0.230	0.100		1.734	
	Total Quantity						10.404 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						10.404 cum	
	Say 10.404 cum @ Rs 7367.55 / cum						Rs 76651.99	
7	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate,							

	retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	For foundation							
	Rectangular part	30	1.500	1.500	0.150		10.125	
	Trapezoidal part	30	0.865	0.865	0.150		3.368	
	For beam	1	75.350	0.230	0.230		3.987	
	For column	30	0.230	0.230	0.600		0.953	
	For coping	1	75.350	0.230	0.150		2.600	
	Total Quantity						21.033 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						21.033 cum	
	Say 21.033 cum @ Rs 9413.54 / cum						Rs 197994.99	
8	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	For column	30	0.230	0.230	3.000		4.761	
	Total Quantity						4.761 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						4.761 cum	
	Say 4.761 cum @ Rs 11065.64 / cum						Rs 52683.51	
9	5.9.1 Centering and shuttering including strutting, etc. and removal of form for:Foundations, footings, bases of columns, etc for mass concrete							
	Rectangular part	120	1.500		0.150		27.000	
	Trapezoidal part	120	0.865		0.150		15.570	
	For column	120	0.230		0.600		16.561	
	Total Quantity						59.131 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						59.131 sqm	

	Say 59.131 sqm @ Rs 335.31 / sqm						Rs 19827.22	
10	5.9.5 Centering and shuttering including strutting, etc. and removal of form for:Lintels, beams, plinth beams, girders bressumers and cantilevers							
	For beam	2	75.350		0.230		34.661	
	For coping	2	75.350		0.150		22.605	
	Total Quantity						57.266 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						57.266 sqm	
	Say 57.266 sqm @ Rs 649.82 / sqm						Rs 37212.59	
11	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts							
	For column	120	0.230		3.000		82.801	
	Total Quantity						82.801 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						82.801 sqm	
	Say 82.801 sqm @ Rs 863.64 / sqm						Rs 71510.26	
12	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
		1	25.794	100.000			2579.400	
	Total Quantity						2579.400 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						2579.400 kilogram	
	Say 2579.400 kilogram @ Rs 98.30 / kilogram						Rs 253555.02	
13	6.4.2 Brick work with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in superstructure above plinth level up to floor V level in all shapes and sizes in:Cement mortar 1:6 (1 cement : 6 coarse sand)							
	Wall	1	75.350	2.500	0.230		43.327	
	Total Quantity						43.327 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						43.327 cum	
	Say 43.327 cum @ Rs 8934.70 / cum						Rs 387113.75	
14	13.11							

	18 mm cement plaster in two coats under layer 12 mm thick cement plaster 1:5 (1 cement : 5 coarse sand) finished with a top layer 6 mm thick cement plaster 1:6 (1 cement : 6 fine sand).						
	For Beam	2	75.350		0.230		34.661
	For coping	2	75.350		0.150		22.605
	For column	60	0.230		3.600		49.681
	wall	2	75.350		2.500		376.750
	Total Quantity						483.697 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						483.697 sqm
	Say 483.697 sqm @ Rs 470.02 / sqm						Rs 227347.26
15	13.37.1 White washing with lime to give an even shade:New work (three or more coats)						
	For Beam	2	75.350		0.230		34.661
	For coping	2	75.350		0.150		22.605
	For column	60	0.230		3.600		49.681
	wall	2	75.350		2.500		376.750
	Total Quantity						483.697 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						483.697 sqm
	Say 483.697 sqm @ Rs 33.63 / sqm						Rs 16266.73
16	13.98.1 Wall painting with plastic emulsion paint of approved brand and manufacture to give an even shade:One or more coats on old work						
		1	4.750	2.500			11.875
	Total Quantity						11.875 sqm
	Total Deducted Quantity						0.000 sqm
	Net Total Quantity						11.875 sqm
	Say 11.875 sqm @ Rs 99.66 / sqm						Rs 1183.46
17	od248650/2022_2023 Supplying and fabricating and erection of iron gate with of required size as per direction at site with G.I pipes of 50 mm and specials at all sides G.I pipes rates taken separately)and 40x40x6mm angles as bracing on which 2 No.of m.s sheet of 16 gauge of size 2x2m each is welded as two halves fixing letter "KMRL" including one coat of primer with red lead etc. compete as directed. Gate 2 Nos (1 Main gate of 4mx2m and a wicket gate 1.2m x 2m)						

	Weight of angle 2x(3.2x2) =12.8m, Weight of angle @ 3.5 kg/m	1	12.800	3.500			44.801	
	Weight of specials, elbow, hold fasts and locking arrangements etc. (Lumpsum)	1	40.000				40.000	
	Weight of M.S sheet of 16 gauge plate 2x(2.5x2) @ 17.5 kg/m2	2	5.000	17.500			175.000	
	Add for name plate and wheels	1	30.000				30.000	
	Wastage @ 10%	1	37.210				37.210	
	Data for Wicket gate							
	Length of angle (2x0.75)+(2.5x2) = 6.5m, Weight of angle @ 3.5 kg / m	1	6.500	3.500			22.750	
	Length of flat,25x6 mm = 0.75x6 + 2x2.5 =9.5 m Weight of flat @ 1.18 kg / m	1	9.500	1.180			11.210	
	Weight of specials, hold fasts and locking arrangements etc.	1	20.200				20.200	
	Wastage @ 10%	1	5.420				5.420	
	Total Quantity						386.591 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						386.591 kilogram	
	Say 386.591 kilogram @ Rs 101.28 / kilogram						Rs 39153.94	
18	od248629/2022_2023 Supplying and fabricating GI pipes of 50mm dia and suitable specials for outer frame of Iron gate as per direction at site including applying priming coat of approves steel primer							
	Length of G.I pipe 2x(2x(2+2.5)) = 18 m @6.24 Kg/m	1	18.000	6.240			112.321	
	Total Quantity						112.321 kg	

	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						112.321 kg	
	Say 112.321 kg @ Rs 126.05 / kg						Rs 14158.06	
19	od249463/2022_2023 Supplying and fixing barbed wire fencing over the proposed compound wall with 'L' angle iron 50 x 50 x 6mm & 1.45m posts bent to shape at 2.5m centres with 6 rows of barbed wire and also in a zig zag manner at 25cm c.c. connecting all the rows with barbed wire will be of 2 ply and 12 gauge or other approved size including drilling hole in 'L' iron posts and fixing the posts in cement concrete 1:2:4 of size 15x15x45cm etc as directed.							
		1	82.200				82.200	
	Total Quantity						82.200 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						82.200 metre	
	Say 82.200 metre @ Rs 675.83 / metre						Rs 55553.23	
SI No	Description	No	L	B	D	CF	Quantity	Remark
2 Gardening/Green belt								
1	30.2.14.4 Digging holes in ordinary soil and refilling the same with the excavated earth mixed with manure or sludge in the ratio of 2:1 by volume (2 parts of stacked volume of earth after reduction by 20% : 1 part of stacked volume of manure after reduction by 8%) flooding with water, dressing including removal of rubbish and surplus earth, if any, with all leads and lifts (cost of manure, sludge or extra good earth if needed to be paid for separately) :Holes 45 cm dia, and 45 cm deep							
		76					76.000	
	Total Quantity						76.000 holes	
	Total Deducted Quantity						0.000 holes	
	Net Total Quantity						76.000 holes	
	Say 76.000 holes @ Rs 23.59 / holes						Rs 1792.84	
2	od247488/2022_2023 Providing and fixing planting plants and shrubs on compound wall as directed							
		1	83.000				83.000	
	Total Quantity						83.000 RM	
	Total Deducted Quantity						0.000 RM	
	Net Total Quantity						83.000 RM	
	Say 83.000 RM @ Rs 169.22 / RM						Rs 14045.26	
3	30.2.57.1 Plantation of Trees, Shrubs, and Hedge at site i/c watering and removal of unsaverieable material?s as per direction of officer in charge (excluding cast of plant & water)Cost of plantation per trees plants (for							

	100 nos.=427.45/100)							
		46					46.000	
	Total Quantity						46.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						46.000 no	
	Say 46.000 no @ Rs 8.81 / no						Rs 405.26	
4	30.2.57.2 Plantation of Trees, Shrubs, and Hedge at site i/c watering and removal of unsaverieable material?s as per direction of officer in charge (excluding cast of plant & water)Cost of plantation per Shrubs plants (for 200 nos.=427.45/200)							
		30					30.000	
	Total Quantity						30.000 no	
	Total Deducted Quantity						0.000 no	
	Net Total Quantity						30.000 no	
	Say 30.000 no @ Rs 4.41 / no						Rs 132.30	
SI No	Description	No	L	B	D	CF	Quantity	Remark
3 Paver works								
1	16.1 Preparation and consolidation of sub grade with power road roller of 8 to 12 tonne capacity after excavating earth to an average of 22.5 cm depth, dressing to camber and consolidating with road roller including making good the undulations etc. and re-rolling the sub grade and disposal of surplus earth with lead upto 50 metres.							
		1	10.000	5.000			50.000	
	Total Quantity						50.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						50.000 sqm	
	Say 50.000 sqm @ Rs 184.54 / sqm						Rs 9227.00	
2	16.2 Extra for compaction of earth work in embankment under optimum moisture conditions to give at least 95% of the maximum dry density (proctor density)							
		1	10.000	5.000	0.200		10.000	
	Total Quantity						10.000 cum per km	
	Total Deducted Quantity						0.000 cum per km	
	Net Total Quantity						10.000 cum per km	
	Say 10.000 cum per km @ Rs 21.42 / cum per km						Rs 214.20	
3	16.3.7							

	Supplying and stacking at site.Stone screening 11.2 mm nominal size (Type B)							
		1	10.000	5.000	0.100		5.000	
	Total Quantity						5.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						5.000 cum	
	Say 5.000 cum @ Rs 2328.89 / cum						Rs 11644.45	
4	16.4 Laying, spreading and compacting stone aggregate of specified sizes to WBM specifications in uniform thickness, hand picking, rolling with 3 wheeled road/ vibratory roller 8-10 tonne capacity in stages to proper grade and camber, applying and brooming requisite type of screening / binding material to fill up interstices of coarse aggregate, watering and compacting to the required density.							
		1	10.000	5.000	0.100		5.000	
	Total Quantity						5.000 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						5.000 cum	
	Say 5.000 cum @ Rs 903.10 / cum						Rs 4515.50	
5	16.68 Providing and laying 60 mm thick factory made cement concrete interlocking paver block of M - 30 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge.							
		1	10.000	5.000			50.000	
	Total Quantity						50.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						50.000 sqm	
	Say 50.000 sqm @ Rs 1011.57 / sqm						Rs 50578.50	
SI No	Description	No	L	B	D	CF	Quantity	Remark
4 Cost for supply and plantation of Shrubs and Creepers								
Lump-Sum Total						Rs 17983.00		
	Provision for GST payments (in %) @						0.0%	
Amount reserved for GST payments						0.00		
Total						1761694.00		
Lumpsum for round off						306.00		
TOTAL Rs 1762000.00								
Rounded Total Rs 17,62,000								

Rupees Seventeen Lakh Sixty Two Thousand Only

(Cost Index Applied for this estimate is 35.59%)



Other Engineering Organisations

PRICE

Data Analysis

Compound wall for Pumping station

1 Specification Code: 2.31

2.31

Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50 m outside the periphery of the area cleared

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 100 sqm LABOUR:				
0114	Beldar	Day	1.08	558.00	602.64
0115	Coolie	Day	0.6	558.00	334.80
TOTAL					937.44
Add Water Charges @ 1%					9.37
TOTAL					946.81
Add CPOH @ 15%					142.02
TOTAL					1088.83
Cost of 100.0 sqm					1088.83
Cost per sqm					10.89
Say					10.9

	Cost index 35.59 %				3.88
	Total with Cost index				14.78

2 Specification Code: 2.6.1

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89
TOTAL					1578.52
Cost of 10.0 cum					1578.52
Cost per cum					157.85
Say					157.85

	Cost index 35.59 %				56.18
	Total with Cost index				214.03

3 Specification Code: 2.26.1

2.26

Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80

	TOTAL	675.50
	Add Water Charges @ 1%	6.75
	TOTAL	682.25
	Add CPOH @ 15%	102.34
	TOTAL	784.59
	Cost of 10.0 cum	784.59
	Cost per cum	78.46
	Say	78.45

	Cost index 35.59 %	27.92
	Total with Cost index	106.37

4 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
	TOTAL				1641.80

Add Water Charges @ 1%	16.42
TOTAL	1658.22
Add CPOH @ 15%	248.73
TOTAL	1906.95
Cost of 10.0 cum	1906.95
Cost per cum	190.69
Say	190.7

Cost index 35.59 %	67.87
Total with Cost index	258.57

5 Specification Code: od246903/2022_2023

od246903/2022_2023 :Supplying and filling in trenches, under footing, below plinth level with Sand Gravel mix in 1:3 ratio in desired thickness not more than 20 cm or as decided by Engineer - in- charge, including compacting each layer by rolling / ramming and watering, consolidating all complete as per drawing and direction of Engineer - in-charge

Details of cost for 10 cum

MATERIAL:

Code	Description	Unit	Quantity	Rate	Amount
0982	Coarse sand (zone III)	cum	2.50000	1350.00	3375.00
2203	Coarse sand	cum	2.50000	103.77	259.43
0296	Stone Aggregate(single size): 12.5 mm nominal size	cum	7.50000	1350.00	10125.00
2202	Stone aggregate below 40 mm nominal size	cum	7.50000	103.77	778.28
0114	Beldar 	Day	0.89000	558.00	496.62
0115	Coolie 	Day	1.07000	558.00	597.06
0101	Bhisti	Day	0.89000	617.00	549.13
TOTAL					16180.52

	cost for 10.0 cum				16180.52
	cost for one cum				1618.05
	say				1618.05

	Add Water Charges @ 1.0%				16.18
	Add CPOH @ 15.0%				245.13
	Cost index 35.59 %				668.86
	Total with Cost index				2548.23
	Say				2548.23

6 Specification Code: 4.1.5

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.5 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.7	1350.00	945.00
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.24	1350.00	324.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.94	103.77	97.54
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77

0367	Portland Cement (0.15674 cum)	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement LABOUR:	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

	TOTAL	4678.18
	Add Water Charges @ 1%	46.78
	TOTAL	4724.96
	Add CPOH @ 15%	708.74
Other Engineering Organisations	TOTAL	5433.70
PRICE	Cost of 1.0 cum	5433.70
	Say	5433.7

	Cost index 35.59 %				1933.85
	Total with Cost index				7367.55

7 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content

considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30

0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL					5977.32
Add Water Charges @ 1%					59.77
TOTAL					6037.09
Add CPOH @ 15%					905.56
TOTAL					6942.65
Cost of 1.0 cum					6942.65
Say					6942.65

Cost index 35.59 %					2470.89
Total with Cost index					9413.54

8 Specification Code: 5.33.2

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2

All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50

0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level $0.75 \times 2.5 = 1.88$	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL				7026.36
Add Water Charges @ 1%				70.26
TOTAL				7096.62
Add CPOH @ 15%				1064.49

TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

Cost index 35.59 %	2904.54
Total with Cost index	11065.64

9 Specification Code: 5.9.1

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.1 Foundations, footings, bases of columns, etc for mass concrete

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for footing size 2.7mx2.7mx 1.00m Contact area = 10.8sqm MATERIAL: Assuming shuttering material will become unserviceable after use of 40 times Adding for maintenance @ 10% of cost Taking salvage value after full use of material @ 25% of cost				
7319	wall form panel 1250x500 mm Qty taken for cost of using once = $16 \times 0.85 / 40 = 0.34$	each	0.34	860.00	292.40
7326	Corner angle 45x45x5 mm 1.50 m long Qty taken for cost of using once = $4 \times 0.85 / 40 = 0.085$	each	0.085	240.00	20.40
7327	100 mm channel shoulder 2.5 m long Qty taken for cost of using once = $8 \times 0.85 / 40 = 0.17$	each	0.17	910.00	154.70

7328	Double clip (bridge clip) Qty taken for cost of using once = $16 \times 0.85 / 40 = 0.34$	each	0.34	76.00	25.84
7329	Single clip Qty taken for cost of using once = $8 \times 0.85 / 40 = 0.17$	each	0.17	59.00	10.03
7330	M.S. Tube 40 mm dia Qty taken for cost of using once = $10.8 \times 0.85 / 40 = 0.2295$	metre	0.2295	215.00	49.34
9999	Sundries-Assembly nuts 7 bolts Qty taken for cost of using once = $1040 \times 0.85 / 40 = 22.10$	L.S	22.1	2.00	44.20
9977	Carriage LABOUR	L.S	78.0	2.00	156.00
0116	Fitter(grade1)	Day	0.75	738.00	553.50
0114	Beldar	Day	1.5	558.00	837.00
9999	Sundries-Suttering oil	L.S	52.0	2.00	104.00
9999	Sundries-Other Engineering Organisation	L.S	26.0	2.00	52.00

TOTAL				2299.41
Add Water Charges @ 1%				22.99
TOTAL				2322.40
Add CPOH @ 15%				348.36
TOTAL				2670.76
Cost of 10.8 sqm				2670.76
Cost per sqm				247.29
Say				247.3

Cost index 35.59 %					88.01
Total with Cost index					335.31

10 Specification Code: 5.9.5

SUBHEAD : 5.0**REINFORCED CEMENT CONCRETE****5.9** Centering and shuttering including strutting, etc. and removal of form for:**5.9.5** Lintels, beams, plinth beams, girders bressumers and cantilevers

Code	Description	Unit	Quantity	Rate	Amount
	<p>Details of cost for a beam of 6 m clear span, 0.50 m deep 0.30 m wide and height 3.5 m from floor cubical contents</p> <p>$6.60 \times 0.5 \times 0.3 = 0.99 \text{ cum}$</p> <p>$1 \times 1.30 \times 6.00 = 7.80 \text{ sqm}$</p> <p>MATERIAL:</p> <p>Assuming shuttering will become unserviceable after use of 40 times</p> <p>Add maintenance charges @ 10% of cost of material</p> <p>Less salvage value of material after full use @25% of cost of material</p> <p>1. Steel plats for side and bottom (plate size 1.20 x 0.50 m)</p> <p>Angle 40x40x5mm</p> <p>$2 \times 1.20 = 2.40 \text{ m}$</p> <p>$3 \times 0.50 = 1.50 \text{ m}$</p> <p>Total 3.90 m @ 3.00 kg/m = 11.70 kg</p> <p>sheet 1.6 mm thick 1.20 m x 0.50 m = 0.60 sqm</p> <p>$0.60 \text{ sqm} @ 12.55 \text{ kg/sqm.} = 7.53 \text{ kg.}$</p> <p>Weight of one plate = 19.23 kg.</p> <p>Add for wastage 5% 0.96 kg.</p> <p>Total = 20.19 kg</p> <p>Total weight of all plates</p> <p>$3 \times 5 \times 20.19 = 302.85 \text{ kg}$</p> <p>Qty taken for cost of using once = $302.85 \times 85/40 = 6.4356 \text{ kg}$</p>				

10.1	Rate as per item Number 10.1 of SH: Steel Work	kilogram	6.4356	74.70	480.74(A)
7343	Adjustable telescopic prop 3 m (2.02-3.75m) Qty taken for using once = $6 \times 0.85 / 40 = 0.1275$ m	each	0.1275	955.00	121.76
7344	Beam clamp 300-380 mm (450-1070 mm) Qty taken for cost of using once = $5 \times 0.85 / 40 = 0.1063$ m	each set	0.1063	355.00	37.74
9999	Sundries - Assembly nut & bolts etc. Qty taken for cost of using once = $1040 \times 0.85 / 40 = 22.10$	L.S	22.1	2.00	44.20
9999	Sundries - Carriage LABOUR:	L.S	78.0	2.00	156.00
0116	Fitter(grade1)	Day	1.25	738.00	922.50
0114	Beldar	Day	2.5	558.00	1395.00
9999	Sundries - Shuttering oil	L.S	39.0	2.00	78.00
9999	Sundries - paper tape etc	L.S	24.61	2.00	49.22

Add Water Charges @ 1% except on A ie on (3285.16-480.74=2804.42)					28.04
TOTAL					3313.20
Add CPOH @ 15% except on A ie on (3313.2-480.74=2832.46)					424.87
TOTAL					3738.15
Cost of 7.8 sqm					3738.15
Cost of 1 sqm					479.25
Say					479.25

Cost index 35.59 %					170.57
Total with Cost index					649.82

11 Specification Code: 5.9.6

5.9 Centering and shuttering including strutting, etc. and removal of form for:**5.9.6** Columns, Pillars, Piers, Abutments, Posts and Struts

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 4.5 sqm. Size of column 450x450mm and 2.5 m high Area of contact = $4 \times 0.45 \times 2.5 = 4.5$ sqm MATERIAL: Assuming shuttering will become unserviceable after use of 40 times Add maintenance charges @ 10 % of cost of material Less salvage value of material after full use @ 25% of cost of material				
7331	Wall form panel 1250x450xmm Qty taken for cost of using once = $8 \times 0.85 / 40 = 0.17$	each	0.17	860.00	146.20
7332	Corner angle 45x45x5 mm 2.50 long Qty taken for cost of using once = $4 \times 0.85 / 40 = 0.085$	each	0.085	255.00	21.68
7333	Column clamp 450x1070 mm Qty taken for cost of using once = $5 \times 0.85 / 40 = 0.1063$	each	0.1063	965.00	102.58
7334	Prop 2 m (2-3.5m) Qty taken for cost of using once = $4 \times 0.85 / 40 = 0.085$	each	0.085	635.00	53.98
9999	Sundries-Qty taken for cost of using once = $1300 \times 0.85 / 40 = 27.62$	L.S	27.62	2.00	55.24
9977	Carriage LABOUR	L.S	52.0	2.00	104.00
0116	Fitter(grade1)	Day	1.0	738.00	738.00

0114	Beldar	Day	2.0	558.00	1116.00
9999	Sundries-Shuttering oil	L.S	39.0	2.00	78.00
9999	Sundries-Carriage	L.S	26.0	2.00	52.00

TOTAL					2467.68
Add Water Charges @ 1%					24.68
TOTAL					2492.36
Add CPOH @ 15%					373.85
TOTAL					2866.21
Cost of 4.5 sqm					2866.21
Cost per sqm					636.94
Say					636.95

Cost index 35.59 %					226.69
Total with Cost index					863.64

12	Specification Code: 5.22.6
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5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6

Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69

9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL					6241.51
Add Water Charges @ 1%					62.42
TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52
Cost per kilogram					72.50
Say					72.5

Cost index 35.59 %					25.80
Total with Cost index					98.30

13 Specification Code: 6.4.2

6.4 Brick work with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in superstructure above plinth level up to floor V level in all shapes and sizes in:

6.4.2 Cement mortar 1:6 (1 cement : 6 coarse sand)(from floor 2 level up to floor 5 level)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum				

2602	Common burnt clay F.P.S. (non modular) bricks class designation 7.5 Cement mortar 1:6	1000 nos	494.0	4500.00	2223.0
3.11	Rate as per item Number 3.11 of SH: Mortars	cum	0.25	3356.15	839.04
2201	Carriage of Bricks	1000 nos	494.0	276.72	136.69969
9999	Sundries-LABOUR:	L.S	2.73	2.00	5.46
0123	Mason (brick layer) 1st class	Day	0.47	738.00	346.86
0124	Mason (brick layer)2nd class	Day	0.47	679.00	319.13
0115	Coolie	Day	1.8	558.00	1004.40
0101	Bhisti	Day	0.2	617.00	123.40
9999	Sundries-Scaffolding Extra labour element required for lifting of materials (above floor two level upto floor five level)	L.S	22.36	2.00	44.72
0115	Coolie	Day	1.13	558.00	630.54

TOTAL				5673.25
Add Water Charges @ 1%				56.73
TOTAL				5729.98
Add CPOH @ 15%				859.50
TOTAL				6589.48
Cost of 1.0 cum				6589.48
Say				6589.5

Cost index 35.59 %					2345.20
Total with Cost index					8934.70

14 Specification Code: 13.11

13.11

18 mm cement plaster in two coats under layer 12 mm thick cement plaster 1:5 (1 cement : 5 coarse sand) finished with a top layer 6 mm thick cement plaster 1:6 (1 cement : 6 fine sand).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Under layer Cement mortar 1: 5 (1 cement : 5 coarse sand)				
3.10	Rate as per item Number3.10 of SH: Mortars Top layer Cement mortar 1:6 (1 cement : 6 fine sand)	cum	0.144	3658.10	526.77
3.6	Rate as per item Number3.6 of SH: Mortars LABOUR:	cum	0.072	2874.65	206.97
0155	Mason (average)	Day	1.21	709.00	857.89
0115	Coolie	Day	1.29	558.00	719.82
0101	Bhisti	Day	1.05	617.00	647.85
9999	Sundries-Scaffolding and sundries	L.S	12.61	2.00	25.22
TOTAL					2984.52
Add Water Charges @ 1%					29.85
TOTAL					3014.37
Add CPOH @ 15%					452.16
TOTAL					3466.53
Cost of 10.0 sqm					3466.53
Cost per sqm					346.65
Say					346.65

	Cost index 35.59 %				123.37
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	Total with Cost index				470.02
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15 Specification Code: 13.37.1

13.37 White washing with lime to give an even shade:

13.37.1 New work (three or more coats)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of limeLABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.2	617.00	123.40
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	4.42	2.00	8.84
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46
TOTAL					213.32
Add Water Charges @ 1%					2.13
TOTAL					215.45
Add CPOH @ 15%					32.32
TOTAL					247.77
Cost of 10.0 sqm					247.77
Cost per sqm					24.78
Say					24.8

	Cost index 35.59 %				8.83
	Total with Cost index				33.63

16 Specification Code: 13.98.1

13.98

Wall painting with plastic emulsion paint of approved brand and manufacture to give an even shade:

13.98.1

One or more coats on old work

Code	Description	Unit	Quantity	Rate	Amount
	Detail of cost for 10 sqm MATERIAL				
0835	Plastic emulsion paint	Litre	0.73	200.00	146.00
9999	Sundries-Material for filling holes and cracks(putty etc.)	L.S	0.52	2.00	1.04
9977	Carriage of material LABOUR	L.S	5.33	2.00	10.66
0131	Painter	Day	0.36	679.00	244.44
0115	Coolie	Day	0.36	558.00	200.88
9999	Sundries-Brushes, sand paper etc	L.S	8.06	2.00	16.12
9999	Sundries-	L.S	6.76	2.00	13.52
TOTAL					632.66
Add Water Charges @ 1%					6.33
TOTAL					638.99
Add CPOH @ 15%					95.85
TOTAL					734.84
Cost of 10.0 sqm					734.84
Cost per sqm					73.48
Say					73.5

	Cost index 35.59 %				26.16
	Total with Cost index				99.66

17 Specification Code: od248650/2022_2023

od248650/2022_2023 :Supplying and fabricating and erection of iron gate with of required size as per direction at site with G.I pipes of 50 mm and specials at all sides GI pipes rates taken separately)and 40x40x6mm angles as bracing on which 2 No.of m.s sheet of 16 gauge of size 2x2m each is welded as two halves fixing letter "KMRL' including one coat of primer with red lead etc.compete as directed. Gate 2 Nos (1 Main gate of 4mx2m and a wicket gate 1.2m x 2m)

Details of cost for one quintal

MATERIAL:

Steel: 1.00q

Add wastage @ 5% = 0.05q

Total+ 1.05q

Code	Description	Unit	Quantity	Rate	Amount
1007	Structural steel such as tees, angles, channels and R.S. joists 	quintal	1.05000	4600.00	4830.00
2205	Steel LABOUR:	tonne	0.10500	92.24	9.69
0116	Fitter(grade1) 	Day	0.50000	738.00	369.00
0103	Blacksmith 2nd class 	Day	0.75000	679.00	509.25
0114	Beldar Prime coat	Day	1.00000	558.00	558.00
13.50.3	Rate as per item number13.50.3of SH:Finishing 	sqm	3.00000	37.88	113.65
9999	Sundries 	L.S	20.67000	2.00	41.34
TOTAL					6430.93
	cost for 100.0 kilogram				6430.93
	cost for one kilogram				64.31
	say				64.31

	Add Water Charges @ 1.0%				0.64
	Add CPOH @ 15.0%				9.74
	Cost index 35.59 %				26.58
	Total with Cost index				101.28

	Say				101.28
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18 Specification Code: od248629/2022_2023

od248629/2022_2023 :Supplying and fabricating GI pipes of 50mm dia and suitable specials for outer frame of Iron gate as per direction at site including applying priming coat of approves steel primer

MATERIAL:

G.I. pipe 50 mm nominal bore = 5.40m

Add wastage @ 5% = 0.27m

Total = 5.67 m

Code	Description	Unit	Quantity	Rate	Amount
1550	G.I pipes 50 mm dia	metre	5.67000	310.00	1757.70
2271	G.I. pipes below 100 mm dia	tonne	0.03500	92.24	3.23
13.50.3	Rate as per item number 13.50.3 of SH:Finishing 	sqm	1.02000	37.88	38.64
1215	Welding by electric plant (joints of hand rail and ballusters) 18x4x1.00 = 72cm LABOUR: Labour for cutting assembling & erection	cm	72.00000	2.00	144.00
0102	Blacksmith 1st class 	Day	0.24000	738.00	177.12
0114	Beldar 	Day	0.90000	558.00	502.20
0100	Bandhani 	Day	0.12000	617.00	74.04
TOTAL					2696.93
	cost for 33.696 kg				2696.93
	cost for one kg				80.04
	say				80.04

	Add Water Charges @ 1.0%				0.80
	Add CPOH @ 15.0%				12.12
	Cost index 35.59 %				33.08
	Total with Cost index				126.05

	Say				126.05
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19 Specification Code: od249463/2022_2023

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od249463/2022_2023 :Supplying and fixing barbed wire fencing over the proposed compound wall with 'L' angle iron 50 x 50 x 6mm & 1.45m posts bent to shape at 2.5m centres with 6 rows of barbed wire and also in a zig zag manner at 25cm c.c. connecting all the rows with barbed wire will be of 2 ply and 12 gauge or other approved size including drilling hole in 'L' iron posts and fixing the posts in cement concrete 1:2:4 of size 15x15x45cm etc as directed.

Code	Description	Unit	Quantity	Rate	Amount
MR	Supplying and fixing barbed wire fencing over the proposed compound wall with 'L' angle iron 50 x 50 x 6mm & 1.45m posts bent to shape at 2.5m centres with 6 rows of barbed wire and also in a zig zag manner at 25cm c.c. connecting all the rows with barbed wire will be of 2 ply and 12 gauge or other approved size including drilling hole in 'L' iron posts and fixing the posts in cement concrete 1:2:4 of size 15x15x45cm etc as directed.	metre	1.00000	675.83	675.83
TOTAL					675.83
	cost for 1.1615 metre				675.83
	cost for one metre				581.86
	say				581.86

	Add Water Charges @ 1.0%				5.81
	Add CPOH @ 15.0%				88.15
	Cost index 35.59 %				-0.01
	Total with Cost index				675.83
	Say				675.83

Gardening/Green belt

1 Specification Code: 30.2.14.4

SUBHEAD : 30.0**HORTICULTURE****30.2.14**

Digging holes in ordinary soil and refilling the same with the excavated earth mixed with manure or sludge in the ratio of 2:1 by volume (2 parts of stacked volume of earth after reduction by 20% : 1 part of stacked volume of manure after reduction by 8%) flooding with water, dressing including removal of rubbish and surplus earth, if any, with all leads and lifts (cost of manure, sludge or extra good earth if needed to be paid for separately) :

30.2.14.4 Holes 45 cm dia, and 45 cm deep

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 hole Volume- $[(22/7) \times 0.225 \times 0.225 \times 0.45] = 0.07$ cum Excavation				
	Other Engineering Organisations				
2.8.1	Rate as per item Number 2.8.1 of SH: Earth Work	cum	0.07	219.00	15.33(A)
9999	Sundries - Refilling mixture and flooding	L.S	0.88	2.00	1.76
Add Water Charges @ 1% except on A ie on (17.09-15.33=1.7600001)					.02
TOTAL					17.11
Add CPOH @ 15% except on A ie on (17.11-15.33=1.7800001)					.27
TOTAL					17.40
Cost of 1.0 holes					17.40
Say					17.4

	Cost index	35.59 %			6.19
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	Total with Cost index				23.59
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2 Specification Code: od247488/2022_2023

od247488/2022_2023 :Providing and fixing planting plants and shrubs on compound wall as directed

Code	Description	Unit	Quantity	Rate	Amount
MR	Providing and fixing planting plants and shrubs on compound wall as directed 	RM	1.00000	169.00	169.00
TOTAL					169.00
	cost for 1.16 RM				169.00
	cost for one RM				145.69
	say				145.69

	Add Water Charges @ 1.0%				1.45
	Add CPOH @ 15.0%				22.07
	Cost index 35.59 %				0.00
	Total with Cost index				169.22
	Say				169.22

3 Specification Code: 30.2.57.1

30.2.57 Plantation of Trees, Shrubs, and Hedge at site i/c watering and removal of unsaverieable material?s as per direction of officer in charge (excluding cast of plant & water)

30.2.57.1 Cost of plantation per trees plants (for 100 nos.=427.45/100)

Code	Description	Unit	Quantity	Rate	Amount
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	Details cost of plantation for 100 nos (Based on actual observation)				
0114	Beldar I)-Preparation of pits for plantation. Putting vigorous growth ,Removing polythene bags /earthen pots/ carefully to avoid breaking of earth ,Plantation and watering to plant. Removal of unserviceable and waste materials from the site	Day	1.0	558.00	558.00

TOTAL					558.00
Add Water Charges @ 1%					5.58
TOTAL					563.58
Add CPOH @ 15%					84.54
TOTAL					648.12
Cost of 100.0 no					648.12
Cost of each					6.48
Other Engineering Organisations Say					6.5

	Cost index 35.59 %				2.31
	Total with Cost index				8.81

4 Specification Code: 30.2.57.2
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30.2.57 Plantation of Trees, Shrubs, and Hedge at site i/c watering and removal of unserviceable material? as per direction of officer in charge (excluding cost of plant & water)

30.2.57.2 Cost of plantation per Shrubs plants (for 200 nos.=427.45/200)

Code	Description	Unit	Quantity	Rate	Amount
	Details cost of plantation for 100 nos (Based on actual observation)				

0114	Beldar I)-Preparation of pits for plantation. Putting vigorous growth ,Removing polythene bags /earthen pots/ carefully to avoid breaking of earth ,Plantation and watering to plant. Removal of unserviceable and waste materials from the site	Day	1.0	558.00	558.00
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TOTAL					558.00
Add Water Charges @ 1%					5.58
TOTAL					563.58
Add CPOH @ 15%					84.54
TOTAL					648.12
Cost of 200.0 no					648.12
Cost of each					3.24
Say					3.25

Other Engineering Organisations					
Cost index 35.59 %					1.16
Total with Cost index					4.41

Paver works					
1 Specification Code: 16.1					

16.1

Preparation and consolidation of sub grade with power road roller of 8 to 12 tonne capacity after excavating earth to an average of 22.5 cm depth, dressing to camber and consolidating with road roller including making good the undulations etc. and re-rolling the sub grade and disposal of surplus earth with lead upto 50 metres.

Code	Description	Unit	Quantity	Rate	Amount
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	Details of cost for 100 sqm MATERIAL: (A) preparation of subgrade. Earth work in excavation including dressing etc. 100sqm. x22.5 cm (average depth) = 22.5 cum LABOUR:				
0128	Mate	Day	1.8	617.00	1110.60
0115	Coolie	Day	18.0	558.00	10044.00
0114	Beldar	Day	0.27	558.00	150.66
0003	Hire charges of Diesel Road Roller- 8 to 10 tonne	Day	0.054	3000.00	162.00
0113	Chowkidar	Day	0.054	558.00	30.13
9999	Sundries-(B) Consolidation of sub grade Roller charges (one roller does 1860 sqm. of consolidation of sub- grade with road roller of 8 to 12 tonne capacity including making good the undulations etc. with earth or quarry spoils etc. and rerolling the subgrade	L.S	6.76	2.00	13.52
0003	Hire charges of Diesel Road Roller- 8 to 10 tonne	Day	0.054	3000.00	162.00
0113	Chowkidar	Day	0.054	558.00	30.13
9999	Sundries-	L.S	6.76	2.00	13.52

TOTAL	11716.56
Add Water Charges @ 1%	117.17
TOTAL	11833.73
Add CPOH @ 15%	1775.06
TOTAL	13608.79
Cost of 100.0 sqm	13608.79
Cost per sqm	136.09

	Say	136.1
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	Cost index 35.59 %				48.44
	Total with Cost index				184.54

2 Specification Code: 16.2

16.2

Extra for compaction of earth work in embankment under optimum moisture conditions to give at least 95% of the maximum dry density (proctor density)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum LABOUR: (Extra to item No. 2.3 in Earth work)				
0101	Bhisti Roller charge (one roller does 1860 sqm. of consolidation per day of 8 hours and uses 18 litres diesel)	Day	0.17	617.00	104.89
0003	Hire charges of Diesel Road Roller- 8 to 10 tonne	Day	0.008	3000.00	24.00
0113	Chowkidar	Day	0.008	558.00	4.46
9999	Sundries-	L.S	1.43	2.00	2.86
TOTAL					136.21
Add Water Charges @ 1%					1.36
TOTAL					137.57
Add CPOH @ 15%					20.64
TOTAL					158.21
Cost of 10.0 cum per km					158.21
Cost per cum per km					15.82
Say					15.8

	Cost index 35.59 %				5.62
	Total with Cost index				21.42

3 Specification Code: 16.3.7

16.3 Supplying and stacking at site.

16.3.7 Stone screening 11.2 mm nominal size (Type B)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
2911	Stone Chippings/ screenings 10/ 11.2 mm nominal size	cum	0.1	1150.00	115.00
2903	Stone chippings/ screenings 4.75 mm nominal size	cum	0.75	1400.00	1050.00
2904	Stone chippings/ screenings 150 micron nominal size	cum	0.15	1400.00	210.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
2267	Carriage of Stone dust	cum	0.15	103.77	15.57
TOTAL					1478.77
Add Water Charges @ 1%					14.79
TOTAL					1493.56
Add CPOH @ 15%					224.03
TOTAL					1717.59
Cost of 1.0 cum					1717.59
Say					1717.6

	Cost index 35.59 %				611.29
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	Total with Cost index				2328.89
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4 Specification Code: 16.4

16.4

Laying, spreading and compacting stone aggregate of specified sizes to WBM specifications in uniform thickness, hand picking, rolling with 3 wheeled road/vibratory roller 8-10 tonne capacity in stages to proper grade and camber, applying and brooming requisite type of screening / binding material to fill up interstices of coarse aggregate, watering and compacting to the required density.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum LABOUR:				
0114	Beldar	Day	0.26	558.00	145.08
0115	Coolie	Day	0.26	558.00	145.08
0101	Bhisti Roller charges (one roller does 30 cum consolidation per day of 8 hours and uses 18 litres of diesel oil)	Day	0.26	617.00	160.42
0003	Hire charges of Diesel Road Roller- 8 to 10 tonne	Day	0.033	3000.00	99.00
0113	Chowkidar	Day	0.033	558.00	18.41
9999	Sundries-	L.S	2.73	2.00	5.46
TOTAL					573.45
Add Water Charges @ 1%					5.73
TOTAL					579.18
Add CPOH @ 15%					86.88
TOTAL					666.06
Cost of 1.0 cum					666.06
Cost per cum					666.06
Say					666.05

	Cost index 35.59 %				237.05
	Total with Cost index				903.10

5 Specification Code: 16.68

16.68

Providing and laying 60 mm thick factory made cement concrete interlocking paver block of M - 30 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including 50 mm thick compacted bed of coarse sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost of 10 sqm MATERIAL:				
8689	Interlocking C.C. paver block (60 mm thick, M-30) Beading Layer 50 mm thick	sqm	10.0	400.00	4000.00
0982	Coarse sand (zone III) = 10x0.050 = 0.50 cum	cum	0.5	1350.00	675.00
2203	Carriage of Coarse sand	cum	0.5	103.77	51.89
0983	Fine sand (zone IV)	cum	0.15	900.00	135.00
2261	Carriage of Fine sand (1 part badarpur sand : 2 parts jamuna sand Laying charges (Based on actual observation)	cum	0.15	103.77	15.57
0123	Mason (brick layer) 1st class	Day	0.5	738.00	369.00
0124	Mason (brick layer)2nd class	Day	0.5	679.00	339.50
0114	Beldar	Day	1.0	558.00	558.00
0115	Coolie	Day	0.5	558.00	279.00
TOTAL					6422.96
Add Water Charges @ 1%					64.23

TOTAL	6487.19
Add CPOH @ 15%	973.08
TOTAL	7460.27
Cost of 10.0 sqm	7460.27
Cost per sqm	746.03
Say	746.05

Cost index 35.59 %	265.52
Total with Cost index	1011.57



Other Engineering Organisations

PRICE

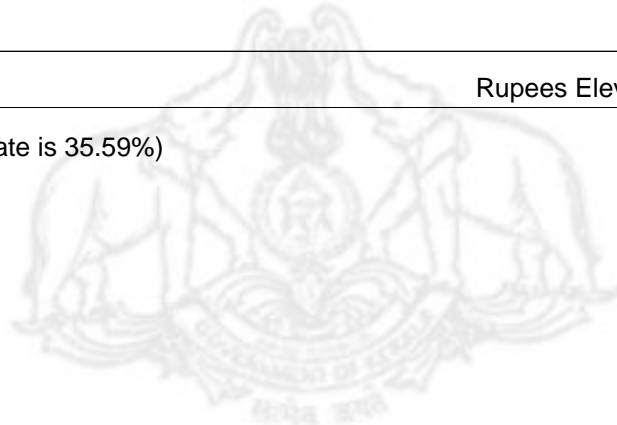
**Construction of Valve chamber for Collection System in Sewerage Systems -
Pumping mains (For Elamkulam STP)**

General Abstract

(Dsr year: **2018**, Cost Index Applied for this estimate is **35.59%**)

SI No	Heading Description	Amount
1	Valve chamber for air valves , Scour valves	1179076.13
	Provision for GST payments (in %) @	0.0%
	Amount reserved for GST payments	0.00
	Total	1179076.00
	Lumpsum for round off	924.00
		TOTAL Rs 1180000.00
		Rounded Total Rs 11,80,000
		Rupees Eleven Lakh Eighty Thousand Only

(Cost Index Applied for this estimate is 35.59%)



Other Engineering Organisations

PRICE

Construction of Valve chamber for Collection System in Sewerage Systems - Pumping mains (For Elamkulam STP)

Abstract Estimate

(Dsor year: **2018**, Cost Index Applied for this estimate is **35.59%**)

1 Valve chamber for air valves , Scour valves		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		194.356 cum
Say 194.356 cum @ Rs 214.03 / cum		Rs 41598.01
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
Net Total Quantity		10.920 cum
Say 10.920 cum @ Rs 2298.93 / cum		Rs 25104.32
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		5.193 cum
Say 5.193 cum @ Rs 7211.15 / cum		Rs 37447.50
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		43.060 cum
Say 43.060 cum @ Rs 9413.54 / cum		Rs 405347.03
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		43.060 cum
Say 43.060 cum @ Rs 82.10 / cum		Rs 3535.23

6	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		4305.605 kilogram
Say 4305.605 kilogram @ Rs 98.30 / kilogram		Rs 423240.97
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		283.126 sqm
Say 283.126 sqm @ Rs 249.69 / sqm		Rs 70693.73
8	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster	
Net Total Quantity		101.641 sqm
Say 101.641 sqm @ Rs 542.29 / sqm		Rs 55118.90
9	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
Net Total Quantity		164.696 sqm
Say 164.696 sqm @ Rs 401.21 / sqm		Rs 66077.68
10	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		57.790 cum
Say 57.790 cum @ Rs 258.57 / cum		Rs 14942.76
11	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
Net Total Quantity		66.000 each
Say 66.000 each @ Rs 545.00 / each		Rs 35970.00
Provision for GST payments (in %) @		0.0%
Amount reserved for GST payments		0.00
Total		1179076.00

Lumpsum for round off	924.00
TOTAL Rs 1180000.00	
Rounded Total Rs 11,80,000	
Rupees Eleven Lakh Eighty Thousand Only	

(Cost Index Applied for this estimate is 35.59%)



Other Engineering Organisations

PRICE

Construction of Valve chamber for Collection System in Sewerage Systems - Pumping mains (For Elamkulam STP)

Detailed Estimate

(Dsr year: **2018**, Cost Index Applied for this estimate is **35.59%**)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
1 Valve chamber for air valves , Scour valves								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed. All kinds of soil							
	For air valves 8 nos							
	Air valve -Valve Chamber Size 1.2mx0.9mx2.2m	8	2.600	2.300	2.680		128.212	
	For scour valves 3 nos							
	Scour valve -Valve Chamber Size 1.8 x 1.2 m	3	3.200	2.600	2.650		66.144	
	Total Quantity						194.356 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						194.356 cum	
	Say 194.356 cum @ Rs 214.03 / cum						Rs 41598.01	
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
	For air valves 8 nos							
	Air valve -Valve Chamber Size 1.2mx0.9mx2.2m	8	2.600	2.300	0.150		7.176	
	For scour valves 3 nos							
	Scour valve -Valve Chamber Size 1.8mx1.2mx2.2m	3	3.200	2.600	0.150		3.744	
	Total Quantity						10.920 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						10.920 cum	
	Say 10.920 cum @ Rs 2298.93 / cum						Rs 25104.32	

3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	For air valves 8 nos							
	Air valve -Valave Chamber Size 1.2mx0.9mx2.2m	8	2.200	1.900	0.100		3.344	
	For scour valves 3 nos							
	Scourvalve -Valave Chamber Size 1.8mx1.2mx2.2m	3	2.800	2.200	0.100		1.849	
	Total Quantity						5.193 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						5.193 cum	
	Say 5.193 cum @ Rs 7211.15 / cum						Rs 37447.50	
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	For air valve 8Nos							
	Valve Chambers for Air valve Raft	1*8	2.000	1.700	0.200		5.440	
	Walls	2*8	1.600	0.200	2.200		11.265	
		2*8	0.900	0.200	2.200		6.337	
		1*8	2.200	1.300	0.180		4.119	
	For scour valve 3 Nos							
	Valve Chambers for scour valve Raft	1*3	2.600	2.000	0.200		3.120	
	Walls	2*3	2.200	0.200	2.200		5.809	
		2*3	1.200	0.200	2.200		3.168	
		2*3	2.200	1.600	0.180		3.802	
	Total Quantity						43.060 cum	

	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						43.060 cum	
	Say 43.060 cum @ Rs 9413.54 / cum						Rs 405347.03	
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	For air valve 8 Nos							
	Valve Chambers for Air valve Raft	1*8	2.000	1.700	0.200		5.440	
	Walls	2*8	1.600	0.200	2.200		11.265	
		2*8	0.900	0.200	2.200		6.337	
		1*8	2.200	1.300	0.180		4.119	
	For scour valve 3 Nos							
	Valve Chambers for scour valve Raft	1*3	2.600	2.000	0.200		3.120	
	Walls	2*3	2.200	0.200	2.200		5.809	
		2*3	1.200	0.200	2.200		3.168	
		2*3	2.200	1.600	0.180		3.802	
	Total Quantity						43.060 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						43.060 cum	
	Say 43.060 cum @ Rs 82.10 / cum						Rs 3535.23	
6	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	For air valve 8 Nos							
	@ 100Kg/m3Valve Chambers for Air valve Raft	1*8	2.000	1.700	0.200	100.0	544.000	
	Walls	2*8	1.600	0.200	2.200	100.0	1126.401	
		2*8	0.900	0.200	2.200	100.0	633.601	
		1*8	2.200	1.300	0.180	100.0	411.841	
	For scour valve 3 Nos							
	Valve Chambers for scour valve Raft	1*3	2.600	2.000	0.200	100.0	312.000	

	Walls	2*3	2.200	0.200	2.200	100.0	580.801	
		2*3	1.200	0.200	2.200	100.0	316.800	
		2*3	2.200	1.600	0.180	100.0	380.161	
	Total Quantity						4305.605 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						4305.605 kilogram	
	Say 4305.605 kilogram @ Rs 98.30 / kilogram						Rs 423240.97	
7	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	For air valve 8 Nos							
	Raft	2*8	2.000		0.200		6.400	
		2*8		1.700	0.200		5.440	
	Walls outer	2*8	1.600		2.200		56.321	
		2*8		1.300	2.200		45.761	
	Walls inner	2*8	1.200		2.200		42.240	
		2*8		0.900	2.200		31.681	
	For scour valve 3 Nos							
	Raft	2*3	2.600		0.200		3.120	
		2*3		2.000	0.200		2.401	
	Walls outer	2*3	2.200		2.200		29.041	
		2*3		1.600	2.200		21.121	
	Walls inner	2*3	1.800		2.200		23.760	
		2*3		1.200	2.200		15.840	
	Total Quantity						283.126 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						283.126 sqm	
	Say 283.126 sqm @ Rs 249.69 / sqm						Rs 70693.73	
8	13.9.2 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.20 mm cement plaster							
	For air valve 8 Nos							
	inside	2*8	1.200		2.200		42.240	
		2*8		0.900	2.200		31.681	
	For scour valve 3 Nos							

	inside	2*3	1.200		2.200		15.840	
		2*3		0.900	2.200		11.880	
	Total Quantity						101.641 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						101.641 sqm	
	Say 101.641 sqm @ Rs 542.29 / sqm						Rs 55118.90	
9	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	For air valve 8 Nos							
	Outside	2*8	1.600		2.380		60.928	
		2*8		1.300	2.380		49.504	
	For scour valve 3 Nos							
	Outside	2*3	2.200		2.380		31.416	
		2*3		1.600	2.380		22.848	
	Total Quantity						164.696 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						164.696 sqm	
	Say 164.696 sqm @ Rs 401.21 / sqm						Rs 66077.68	
10	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	For Air valve 8 Nos							
	Total excavated earth Item 1	1	128.212				128.212	
	For air valve 8 Nos							
	Sand filling Item 2	1	12.558				-12.558	
	PCC item 3	1	5.582				-5.582	
	RCC item 4	1	9.521+19.713+11.089+7.208				-47.531	
	Chamber size	1*8	1.200	0.900	2.200		-19.008	
	For Souir valve 3 Nos							
	Total excavated earth Item 1	1	66.144				66.144	

	For air valve 3 Nos							
	Sand filling Item 2	1	4.992				-4.992	
	PCC item 3	1	2.465				-2.465	
	RCC item 4	1	4.16+7.74 5+4.224+5 .069				-21.198	
	Chamber size	1*3	2.200	1.600	2.200		-23.232	
	Total Quantity						194.356 cum	
	Total Deducted Quantity						-136.566 cum	
	Net Total Quantity						57.790 cum	
	Say 57.790 cum @ Rs 258.57 / cum						Rs 14942.76	
11	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
	Other Engineering Organisations							
	For air valve 8 Nos							
		6*8					48.000	
	For scour valve 3 Nos							
		6*3					18.000	
	Total Quantity						66.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						66.000 each	
	Say 66.000 each @ Rs 545.00 / each						Rs 35970.00	
Provision for GST payments (in %) @					0.0%			
Amount reserved for GST payments					0.00			
Total					1179076.00			
Lumpsum for round off					924.00			
TOTAL Rs 1180000.00								
Rounded Total Rs 11,80,000								
Rupees Eleven Lakh Eighty Thousand Only								

(Cost Index Applied for this estimate is 35.59%)



Other Engineering Organisations

PRICE

Data Analysis

Valve chamber for air valves , Scour valves

1 Specification Code: 2.6.1

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89
TOTAL					1578.52
Cost of 10.0 cum					1578.52
Cost per cum					157.85
Say					157.85

	Cost index 35.59 %				56.18
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	Total with Cost index				214.03
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2 Specification Code: 2.27

2.27

Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
Other Engineering Organisations TOTAL					14597.33
Add Water Charges @ 1%					145.97
TOTAL					14743.30
Add CPOH @ 15%					2211.49
TOTAL					16954.79
Cost of 10.0 cum					16954.79
Cost per cum					1695.48
Say					1695.5

	Cost index 35.59 %				603.43
	Total with Cost index				2298.93

3 Specification Code: 4.1.6

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90

9999	Sundries-	L.S	13.52	2.00	27.04
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TOTAL					4578.85
Add Water Charges @ 1%					45.79
TOTAL					4624.64
Add CPOH @ 15%					693.70
TOTAL					5318.34
Cost of 1.0 cum					5318.34
Say					5318.35

Cost index 35.59 %					1892.80
Total with Cost index					7211.15

4 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50

0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Other Engineering Organisations	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65

Cost of 1.0 cum	6942.65
Say	6942.65

Cost index 35.59 %	2470.89
Total with Cost index	9413.54

5 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

6 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in position	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
TOTAL					6241.51
Add Water Charges @ 1%					62.42
TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52

Cost per kilogram	72.50
Say	72.5

Cost index	35.59 %				25.80
Total with Cost index					98.30

7 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	<p>Details of cost for 26.39 sqm</p> <p>Surface area</p> <p>Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm</p> <p>MATERIAL:</p> <p>Assuming that the timber will become unserviceable after being used 8 times</p> <p>planks 38 mm (Second class kail wood</p> <p>$26.39 \times 0.038 = 1.00$ cum</p> <p>Wastage 2% = 0.20 cum.</p> <p>Total = 1.20 cum . or 1200 cudm.</p> <p>Qty for cost using once = $1200/8 = 150$ cudm</p>				

1198	Second class kail wood in planks 2nd class kail wood battens Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712 \text{ cum}$ Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798 \text{ cum}$ Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = $0.1586/8 = 0.0198 \text{ cum}$	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside $25 \times 1.00 = 25.00 \text{ m}$ Outside $28 \times 1.00 = 28.00 \text{ m}$ Total = 53.00 m Qty for cost using once = $53/8 = 6.625 \text{ m}$ Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Cost index	35.59 %				65.54
Total with Cost index					249.69

8 Specification Code: 13.9.2

13.9 Cement plaster 1:3 (1 cement : 3 coarse sand) finished with a floating coat of neat cement.

13.9.2 20 mm cement plaster

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1 : 3 (1 cement : 3 coarse sand)				
3.8	Rate as per item Number 3.8 of SH: Mortars LABOUR:	cum	0.224	4664.55	1044.86
0155	Mason (average)	Day	0.94	709.00	666.46
0115	Coolie	Day	1.02	558.00	569.16
0101	Bhisti	Day	1.1	617.00	678.70
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
TOTAL					3443.25
Add Water Charges @ 1%					34.43
TOTAL					3477.68
Add CPOH @ 15%					521.65
TOTAL					3999.33
Cost of 10.0 sqm					3999.33
Cost per sqm					399.93

Say	399.95
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Cost index	35.59 %				142.34
Total with Cost index					542.29

9 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand)				
3.3	Rate as per item Number 3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12
TOTAL					2547.60
Add Water Charges @ 1%					25.48
TOTAL					2573.08

Add CPOH @ 15%	385.96
TOTAL	2959.04
Cost of 10.0 sqm	2959.04
Cost per sqm	295.90
Say	295.9

Cost index 35.59 %	105.31
Total with Cost index	401.21

10 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95
Cost per cum					190.69
Say					190.7

	Cost index 35.59 %				67.87
	Total with Cost index				258.57

11 Specification Code: 19.16

SUBHEAD : 19.0

DRAINAGE

19.16

Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foot rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number 4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) 1st class	Day	0.02	738.00	14.76

0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90

AddWater Charges @ 1% except on A ie on (354.8-62.7=292.1)					2.92
TOTAL					357.72
AddCPOH @ 15% except on A ie on (357.72-62.7=295.02)					44.25
TOTAL					401.95
Cost of 1.0 each					401.95
Cost of 1 each					401.95
Say					401.95

	Cost index 35.59 %				143.05
	Total with Cost index				545.00

Other Engineering Organisations

PRICE

ELAMKULAM STP-From WW1 of Block 12A to WW2 of Block 12B								
Detailed Estimate -SCREEN/GRIT WELL (3m dia)								
S. N	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
1	Earth work excavation in hard stiff clay, stiff black cotton, hard red earth, shales, murum, gravel, stoney earth or earth mixed with small size boulders and hard gravelly soil as per SS20B with initial lead of 10m and lift of 2m etc. complete.							
a	For 0 to 2 m depth	$\pi/4$	5.10	5.10	2.00	40.86	41.00	cu.m
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including shuttering for RCC well curb and well steining.							
	Upto 1m above and 3m below GL							
a	well Kerb - inner	1	π	3.00	0.45	4.24		
b	well Kerb - outer	1	π	4.05	1.05	13.36		
c	well Kerb- slope	1	3.00	3.38	0.71	14.22		
d	Side wall	2	π	3.45	5.70	123.56		
	Total					155.38	156.00	sq.m
3	Providing and laying in position machine batched machine mixed and machine vibrated design mix. Sulphate resistance cement concrete M30 grade for reinforced cement concrete structural elements under controlled water cement ratio with plasticiser using 20mm and down graded machine broken granite stone jelly excluding the cost of centering and shuttering and reinforcement but including curing etc. as per standard specification and as directed at site							
	Up to 1.5m Below & 1.0m above ground level							
	Side Wall	1	$\pi()$ *3.45	0.45	5.70	27.80	28.00	cu.m
	From 1.5m to 4.5m below ground level							
	kerb	1	$((0.525*0.45)+(0.15*0.6)+()$			4.86	5.00	cu.m
	From 4.5m to 9.0m below ground level							
	Bottom Slab	1	$3.14/4 \times 3^2$		0.45	3.18	4.00	cu.m
4	C.C 1:1.5:3 using 20mm gauge hard broken stone jelly for PCC works using Sulphate resistance cement including laying, ramming, curing etc complete for benching and channeling as directed.							
	Benching							
i)	4.5m to 9m depth	1	3.00	3.00	0.25	1.77	2.00	cu.m
5	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1	3.9	16.9	kg/m	207.1	207.10	kg

S. N	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
6	Sinking of well below water level including all incidental charges using special tools and plants such as air compressor, helmet etc., complete and including baling out water.							
	3m dia well							
a	First depth of 2m					2	2.00	m
b	Second depth of 2m					1.75	1.75	m
c	Third depth of 2m					0	0.00	m
7	Plugging the bottom of the well using C.C 1:3:6 using 40mm gauge hard broken stone jelly with 10% excess cement for plain cement concrete works including laying in layers of not more than 15cm thick including ramming curing etc complete							
i)	4.5m to 9m depth	1	3.14x3.45 ² /4		0.30	2.12	2.20	cu.m
8	Supplying, fabricating CRS bars manufactured by Primary steel including cost of steel, binding wire, cutting, cranking and tying, in position with binding wire assembly etc complete.	1	35.84	120	kg/cum	4,300.84		
	wastage at 2.5%					108.00		
						4,408.84	4500.00	kg
9	Refilling with excavated earth complying with standard specifications for filling in foundations & basement other than sand including watering & consolidating etc.,							
	Earthwork quantity					40.86		
	Volume of the well	1	3.14/4x3.9 ²		2.00	14.14		
	Total					26.72	27.00	cu.m
10	Disposal of surplus earth							
	Earthwork quantity	1				40.86		
	For sinking well	$\pi/4$	3.90	3.90	3.00	35.84		
	Deduct for Refilling quantity					(26.72)		
	Total					49.97	50.00	cu.m
11	Supplying and fixing C.I.steps.	1				19.00	19.00	nos
12	Colour washing two coats over one coat of white washing							sq.m
	a)well outer	1	3.14	3.90	1.00	12.25		
	b)top of wall thickness	1	3.14	3.45	0.45	4.87		
						17.12	18.00	sq.m

S. N	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
13	Supplying and fixing SS screen of grade 316. The screen shall be fabricated out of stainless steel flats of 50 x 10mm. The outer frame also shall be of 50 x 10mm fixed inside the well for seating the screen. The screen shall be so fabricated that the inclined portion of the screen is fixed and the horizontal portion of the screen is a removable one for lifting the pump for maintenance purpose.							
	outer frame and 50x10mm SS flats spaced at 35mm centre to centre to serve bar screens inside the screen well							
	50mmx10mm flats at 35 mm spacing	29	1			113.68		
	Area of slant screen		3m x 1.9m			5.7	sq.m	
	total weight of flats					647.98	648.00	
	50 x 10mm SS for outer frame	1	9.80			38.42	39.00	
						Total	687.00	
						Total wt of frame	687.00	Kg
14	Supply and installation of SS open mesh flooring with 25x6mm thick flats for outer frame and 25x3mm SS and 12x3mm SS flats spaced at 30mm and 60mm respectively and 50x10mm SS flats for mesh support and 50x50x6mm SS angle for opening forming a mesh over the surface of the well etc,complete							
	Area of pumping station	1				11.940	12.00	sq. mt
	kg of steel per sqm for							
	25 x 3 flats at 30 mm spacing	33	1.00	33.00		19.47		
	12 x 3 flats at 60 mm spacing	17	1.00	17.00		4.76		
					Total	24.23	24.23	kg
	Total area					290.76	290.76	kg
	25 x6 SS for outer frame	1				14.46	14.46	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.90			30.58	30.58	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	1.88			8.43	8.43	
	Misc. items for opening frame	1				5.00	5.00	
						Total	349.23	kg
						Say	350.00	kg

ELAMKULAM STP-From WW1 of Block 12A to WW2 of Block 12B								
DETAILED ESTIMATE-SUCTION WELL (4 m dia)								
Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
1	Earth work excavation in hard stiff clay, stiff black cotton, hard red earth, shales, murum, gravel, stoney earth or earth mixed with small size boulders and hard gravely soil as per SS20B with initial lead of 10m and lift of 2m etc. complete.							
a	For 0 to 2 m depth	$\pi/4$	6.00	6.00	2.00	56.55	57.00	cu.m
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including shuttering for RCC well curb and well steining.							
	Upto 1m above and 3m below GL							
a	well Kerb - inner	1	π	4.00	0.50	6.28		
b	well Kerb - outer	1	π	5.15	1.05	16.99		
c	well Kerb - slope	1	4.00	4.43	0.70	18.53		
d	Side wall	2	π	4.50	6.88	194.53		
	Total					236.33	237.00	sq.m
3	Providing and laying in position machine batched, machine mixed and machine vibrated design mix. Sulphate resistance cement concrete of M30 grade for reinforced cement concrete structural elements under controlled water cement ratio with plasticiser using 20mm and down graded machine broken granite stone jelly excluding the cost of centering and shuttering and reinforcement but including curing, etc. as per standard specification and as directed at site.							
	Up to 1.5m Below & 1.0m above ground level							
	Side wall	1	π	0.50	6.88	48.63		
						48.63	49.00	m3
	From 1.5m to 4.5m below ground level							
	kerb	1	$((0.575*0.5)+(0.15*0.55))+$			2.05	3.00	m3
	From 4.5m to 9.0m below ground level							
	Bottom Slab	1	3.14/4x4^2		0.50	6.28	7.00	m3
4	C.C 1:1.5:3 using 20mm gauge hard broken stone jelly for PCC works using Sulphate resistance cement including laying, ramming, curing etc complete for benching and channeling as directed.							

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
	Benching							
i)	4.5m to 9m depth	1	4.00	4.00	0.25	3.14	4.00	m3
5	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1	5	16.9	kg/m	265.46	265.50	kg
6	Sinking of well below water level including all incidental charges using special tools and plants such as air compressor, helmet etc., complete and including baling out water.							
	4m dia well							
a	First depth of 2m					2	2.00	m
b	Second depth of 2m					2	2.00	m
c	Third depth of 2m					0.93	0.93	m
d	Fourth depth of 2m					0	-	m
7	Plugging the bottom of the well using C.C 1:3:6 using 40mm gauge hard broken stone jelly with 10% excess cement for plain cement concrete works including laying in layers of not more than 15cm thick including ramming curing etc complete							
i)	4.5m to 9m depth	1	$3.14 \times 4.5^2 / 4$		0.30	4.77	4.80	m3
8	Supplying, fabricating CRS bars manufactured by Primary steel including cost of steel, binding wire, cutting, cranking and tying, in position with binding wire assembly etc complete.	1	57.0	120	kg/cum	6,835.78		
	wastage at 2.5%					171.00		
						7,006.78	7,100.00	kg

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
11	Refilling with excavated earth complying with standard specifications for filling in foundations & basement other than sand including watering & consolidating etc.,							
	Earthwork quantity					56.55		
	Total volume of the well	1	3.14/4x5^2		2.00	25.13		
	Total					31.42	32.00	m3
12	Disposal of surplus earth							
	Earthwork quantity	1				56.55		
	For sinking well	$\pi/4$	5.00	5.00	4.93	96.80		
	Deduct for Refilling quantity					(31.42)		
	Total					121.93	122.00	m3
13	Supplying and fixing C.I.steps.	1				22.93	23.00	nos
14	Colour washing two coats over one coat of white washing							m2
a)	well outer	1	3.14	5.00	1.00	15.70		
b)	top of wall thickness	1	3.14	4.50	0.50	7.07		
						22.77	23.00	m2
15	Supply and installation of SS open mesh flooring with 25x6mm thick flats for outer frame and 25x3mm SS and 12x3mm SS flats spaced at 30mm and 60mm respectively and 50x10mm SS flats for mesh support and 50x50x6mm SS angle for opening forming a mesh over the surface of the well etc complete							
	Area of pumping station	1				19.625	20.00	sq. mt
	kg of steel per sqm for							
	25 x 3 flats at 30 mm spacing	33	1	33.00		19.47		
	12 x 3 flats at 60 mm spacing	17	1	17.00		4.76		
					Total	24.23	24.23	kg
	Total area					484.60	484.60	kg
	25 x6 SS for outer frame	1				18.54	18.54	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	5.00			39.20	39.20	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	5.00			22.35	22.35	
	Misc. items for opening frame	1				10.00	10.00	
						Total	574.69	kg
						Say	575.00	kg

ELAMKULAM STP-From WW1 of Block 12A to WW2 of Block 12B								
DETAILED ESTIMATE-SILT PIT - 1.5 m x 1.5 m x 1.2 m								
SL. NO	DESCRIPTION OF WORK	NO	L (m)	B (m)	D (m)	QTY	TOTAL	
1	Earth work excavation	1	2.80	2.80	1.65	12.94	13.00	cu.m
2	Sand filling	1	2.80	2.80	0.15	1.18	2.00	cu.m
3	PCC 1:3:6 , 40mm B.G	1	2.20	2.20	0.10	0.48	1.00	cu.m
4	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft	1	2.00	2.00	0.20	0.80		
		2	2.00	0.25	1.20	1.20		
		2	1.50	0.25	1.20	0.90		
	Baffle wall	1	1.50	0.10	0.95	0.14		
						3.04	4.00	cu.m
5	Steel for RCC work	1	3.0425 x 100 kg / cu.m			304.25	305.00	kg
6	Providing formwork							
	Base slab side	4	2.00		0.20	1.60		
	Inner side	4	1.50		1.20	7.20		
	Outer side	4	2.00		1.20	9.60		
	Baffle wall	2	1.50		0.95	2.85		
					Total	21.25	22.00	sq.m
7	Refilling with excavated soil							
	Total Excavation	1				12.94		
	Deduction							
	Sand filling					1.18		
	PCC	1				0.48		
	RCC	1				3.04		
	Pit Size	1	1.50	1.50	1.20	2.70		
						5.53	5.54	cu.m
8	Disposal of earth work							
	Excavation	1				12.94		
	Refilling	1				5.53		
						7.40	7.41	cu.m

ABSTRACT ESTIMATE- SILT RAISER ARRANGEMENTS			
SL. NO	DESCRIPTION OF WORK	NO. OR QTY	
1	Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.		
	From Desilting pump to silt pit		
a	100mm dia D/F CI Pipe -0.5m length	2.00	Nos.
b	100mm dia D/F CI Pipe -1.0m length	2.00	Nos.
c	100mm dia D/F CI Pipe -2.0m length	2.00	Nos.
d	100 mm dia D/F CI bend 90° bend	2.00	Nos.
e	100 mm D/F 90oDuck Foot Bend	1.00	No.
2	Supplying and laying 100 mm dia CI D/F pipe - 2m length including earthwork excavation in all kinds of soil, including refilling the excavated earth etc. complete.	2	nos.
3	Making flanged joints -100 mm dia including cost of jointing materials	11.00	nos.
4	Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.	10	m
5	Supplying and erection of of desilting pump (including Stsnd by)		

DETAILED ESTIMATE VALVE CHAMBER - 1.9 m x 3.6 m x 1.7 m								
SL. NO	DESCRIPTION OF WORK	NO	L (m)	B (m)	D (m)	QTY	TOTAL	
1	Earth work excavation	1	3.30	5.00	2.15	35.48	36.00	cu.m
2	Sand filling	1	3.30	5.00	0.15	2.48	3.00	cu.m
3	PCC 1:3:6, 40mm B.G with SRC	1	2.90	4.60	0.10	1.33	2.00	cu.m
4	RCC work using Sulphate							
	Raft	1	2.70	4.40	0.20	2.38		
	Walls	2	2.30	0.20	1.70	1.56		
		2	3.60	0.20	1.70	2.45		
						6.39	7.00	cu.m
5	Steel for RCC work	1	6.388 x 100 kg / cu.m			638.80	639.00	kg
6	Precast slab in Cement	1	2.30	4.00	0.18	1.61	1.70	cu.m
7	Providing formwork							
	Raft	2	2.70		0.20	1.08		
		2		4.40	0.20	1.76		
	Walls outer	2	2.30		1.70	7.82		
		2		4.00	1.70	13.60		
	Walls inner	2	1.90		1.70	6.46		
		2		3.60	1.70	12.24		
					Total	42.96	43.00	sq.m
8	Refilling with excavated soil							
	Total Excavation	1				35.48		
	Deduction							
	PCC	1				1.33		
	Sand filling	1				2.48		
	RCC	1				6.39		
	Chamber Size	1	1.90	3.60	1.70	11.63		
						13.65	13.65	cu.m
9	Disposal of earth work							
	Excavation	1				35.48		
	Refilling	1				13.65		
						21.83	21.83	cu.m
10	S&F CI steps	1				6	6 Nos.	

MEASUREMENT SHEET -RCC COLUMN & ISMB								
SR.NO	DESCRIPTION OF WORK	NO	LEN	WIDTH	DEPTH	QTY	TOTAL	
1	RCC work using Sulphate upto 1.5 m from G.L							
	above G.L for column	4.00	0.30	0.30	0.50	0.18	0.20	cu.m
	1.5m to 4.5m above G.L							
	above 1.5m from G.L for column	4.00	0.30	0.30	2.50	0.90	0.90	cu.m
2	Providing form work with							
	upto 3.0m from G.L for column	16.00	0.30		2.00	9.60	9.60	sq.m
	above 3.0 m to 4.0 m	16.00	0.30		1.00	4.80	4.80	sq.m
3	Steel for RCC work	1.00	(1.08)x100 kg/ cu.m			108.00	108.00	kg
4	Plastering with CM 1:3,12mm							
	Side	16.00	0.30		3.00	14.40		
		4.00	0.30	0.30		0.36		
						14.76	15.00	sq.m
5	Colour washing two coats over		same as plastering			14.76	15.00	sq.m
6	Supply and fixing ISMB 300mm	1.00	42.2kg/mx3.9mx1nos			164.58	170.00	kg
7	Supply and fixing ISMB 600mm	1.00	122kg/mx7.2mx1nos			878.40	880.00	kg
8	Erecting with pulley block of 3T	0.00				0.00	0.00	no
8	Erecting with pulley block of 2T	1.00				1.00	1.00	no
9	Erecting with pulley block of 1T	1.00				1.00	1.00	no
10	Painting two coats with superior	2.00	3.90		0.25	1.95		
		4.00	3.90	0.13		1.95		
		2.00	7.20		0.60	8.64		
		4.00	7.20	0.21		6.05		
						18.59	19.00	sq.m

ELAMKULAM STP-From WW2 (Block 12B) to IC@STP								
Detailed Estimate -SCREEN/GRIT WELL (3m dia)								
Sr. No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
1	Earth work excavation in hard stiff clay, stiff black cotton, hard red earth, shales, murum, gravel, stoney earth or earth mixed with small size boulders and hard gravelly soil as per SS20B with initial lead of 10m and lift of 2m etc. complete.							
a	For 0 to 2 m depth	$\pi/4$	5.10	5.10	2.00	40.86	41.00	cu.m
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including shuttering for RCC well curb and well steining.							
	Upto 1m above and 3m below GL							
a	well Kerb - inner	1	π	3.00	0.45	4.24		
b	well Kerb - outer	1	π	4.05	1.05	13.36		
c	well Kerb- slope	1	3.00	3.38	0.71	14.22		
d	Side wall	2	π	3.45	6.30	136.57		
	Total					168.39	169.00	sq.m
3	Providing and laying in position machine batched machine mixed and machine vibrated design mix. Sulphate resistance cement concrete M30 grade for reinforced cement concrete structural elements under controlled water cement ratio with plasticiser using 20mm and down graded machine broken granite stone jelly excluding the cost of centering and shuttering and reinforcement but including curing etc. as per standard specification and as directed at site							
	Up to 1.5m Below & 1.0m above ground level							
	Side Wall	1	$\pi()$ *3.45	0.45	6.30	30.73	31.00	cu.m
	From 1.5m to 4.5m below ground level							
	kerb	1	$((0.525*0.45)+(0.15*0.6)+)$			4.86	5.00	cu.m
	From 4.5m to 9.0m below ground level							
	Bottom Slab	1	$3.14/4*3^2$		0.45	3.18	4.00	cu.m
4	C.C 1:1.5:3 using 20mm gauge hard broken stone jelly for PCC works using Sulphate resistance cement including laying, ramming, curing etc complete for benching and channeling as directed.							
	Benching							
i)	4.5m to 9m depth	1	3.00	3.00	0.25	1.77	2.00	cu.m
5	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1	3.9	16.9	kg/m	207.1	207.10	kg

Sr. No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
6	Sinking of well below water level including all incidental charges using special tools and plants such as air compressor, helmet etc., complete and including baling out water.							
	3m dia well							
a	First depth of 2m					2	2.00	m
b	Second depth of 2m					2	2.00	m
c	Third depth of 2m					0.35	0.35	m
7	using 40mm gauge hard broken stone jelly with 10% excess cement for plain cement concrete works including laying in layers of not more than 15cm thick including ramming curing etc complete							
i)	4.5m to 9m depth	1	3.14x3.45 ² /4		0.30	2.12	2.20	cu.m
8	Supplying, fabricating CRS bars manufactured by Primary steel including cost of steel, binding wire, cutting, cranking and tying, in position with binding wire assembly etc complete.	1	38.77	120	kg/cum	4,652.01		
	wastage at 2.5%					117.00		
						4,769.01	4800.00	kg
9	Refilling with excavated earth complying with standard specifications for filling in foundations & basement other than sand including watering & consolidating etc.,							
	Earthwork quantity					40.86		
	Volume of the well	1	3.14/4x3.9 ²		2.00	14.14		
	Total					26.72	27.00	cu.m
10	Disposal of surplus earth							
	Earthwork quantity	1				40.86		
	For sinking well	$\pi/4$	3.90	3.90	3.60	43.01		
	Deduct for Refilling quantity					(26.72)		
	Total					57.14	58.00	cu.m
11	Supplying and fixing C.I.steps.	1				21.00	21.00	nos
12	Colour washing two coats over one coat of white washing							sq.m
	a)well outer	1	3.14	3.90	1.00	12.25		
	b)top of wall thickness	1	3.14	3.45	0.45	4.87		
						17.12	18.00	sq.m
13	Supplying and fixing SS screen of grade 316. The screen shall be fabricated out of stainless steel flats of 50 x 10mm. The outer frame also shall be of 50 x 10mm fixed inside the well for seating the screen. The screen shall be so fabricated that the inclined portion of the screen is fixed and the horizontal portion of the screen is a removable one for lifting the pump for maintenance purpose.							

Sr. No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
	outer frame and 50x10mm SS flats spaced at 35mm centre to centre to serve bar screens inside the screen well							
	50mmx10mm flats at 35 mm spacing	29	1			113.68		
	Area of slant screen		3m x 1.9m			5.7	sq.m	
	total weight of flats					647.98	648.00	
	50 x 10mm SS for outer frame	1	9.80			38.42	39.00	
						Total	687.00	
						Total wt of frame		687.00 Kg
14	Supply and installation of SS open mesh flooring with 25x6mm thick flats for outer frame and 25x3mm SS and 12x3mm SS flats spaced at 30mm and 60mm respectively and 50x10mm SS flats for mesh support and 50x50x6mm SS angle for opening forming a mesh over the surface of the well etc,complete							
	Area of pumping station	1				11.940	12.00	sq. mt
	kg of steel per sqm for							
	25 x 3 flats at 30 mm spacing	33	1.00	33.00		19.47		
	12 x 3 flats at 60 mm spacing	17	1.00	17.00		4.76		
						Total	24.23	24.23 kg
	Total area					290.76	290.76	kg
	25 x6 SS for outer frame	1				14.46	14.46	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.90			30.58	30.58	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	1.88			8.43	8.43	
	Misc. items for opening frame	1				5.00	5.00	
						Total	349.23	kg
						Say	350.00	kg

ELAMKULAM STP-From WW2 (Block 12B) to IC@STP								
DETAILED ESTIMATE-SUCTION WELL (6 m dia)								
Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
1	Earth work excavation in hard stiff clay, stiff black cotton, hard red earth, shales, murum, gravel, stoney earth or earth mixed with small size boulders and hard gravelly soil as per SS20B with initial lead of 10m and lift of 2m etc. complete.							
a	For 0 to 2 m depth	$\pi/4$	8.00	8.00	2.00	100.53	101.00	cu.m
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including shuttering for RCC well curb and well steining.							
	Upto 1m above and 3m below GL							
a	well Kerb - inner	1	π	6.00	0.60	11.31		
b	well Kerb - outer	1	π	7.35	1.33	30.60		
c	well Kerb - slope	1	6.00	6.53	0.90	35.41		
d	Side wall	2	π	6.60	7.36	305.21		
	Total					382.53	383.00	sq.m
3	Providing and laying in position machine batched, machine mixed and machine vibrated design mix. Sulphate resistance cement concrete of M30 grade for reinforced cement concrete structural elements under controlled water cement ratio with plasticiser using 20mm and down graded machine broken granite stone jelly excluding the cost of centering and shuttering and reinforcement but including curing, etc. as per standard specification and as directed at site.							
	Up to 1.5m Below & 1.0m above ground level							
	Side wall	1	π	0.60	7.36	91.56		
						91.56	92.00	m3
	From 1.5m to 4.5m below ground level							
	kerb	1	$((0.675*0.6)+(0.15*0.725))$			4.50	5.00	m3
	From 4.5m to 9.0m below ground level							
	Bottom Slab	1	$3.14/4 \times 6^2$		0.60	16.96	17.00	m3

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
4	C.C 1:1.5:3 using 20mm gauge hard broken stone jelly for PCC works using Sulphate resistance cement including laying, ramming, curing etc complete for benching and channeling as directed.							
	Benching							
i)	4.5m to 9m depth	1	6.00	6.00	0.25	7.07	8.00	m3
5	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1	7.2	16.9	kg/m	382.27	382.30	kg
6	Sinking of well below water level including all incidental charges using special tools and plants such as air compressor, helmet etc., complete and including baling out water.							
	6m dia well							
a	First depth of 2m					2	2.00	m
b	Second depth of 2m					2	2.00	m
c	Third depth of 2m					1.685	1.69	m
d	Fourth depth of 2m					0	-	m
7	Plugging the bottom of the well using C.C 1:3:6 using 40mm gauge hard broken stone jelly with 10% excess cement for plain cement concrete works including laying in layers of not more than 15cm thick including ramming curing etc complete							
i)	4.5m to 9m depth	1	3.14x6.6^2/4		0.40	13.68	13.70	m3
8	Supplying, fabricating CRS bars manufactured by Primary steel including cost of steel, binding wire, cutting, cranking and tying, in position with binding wire assembly etc complete.	1	113.0	120	kg/cum	13,563.94		
	wastage at 2.5%					340.00		
						13,903.94	14,000.00	kg

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
9	Refilling with excavated earth complying with standard specifications for filling in foundations & basement other than sand including watering & consolidating etc.,							
	Earthwork quantity					100.53		
	Total volume of the well	1	3.14/4x7.2^2	2.00		56.55		
	Total					43.98	44.00	m3
10	Disposal of surplus earth							
	Earthwork quantity	1				100.53		
	For sinking well	$\pi/4$	7.20	7.20	5.69	231.47		
	Deduct for Refilling quantity					(43.98)		
	Total					288.01	289.00	m3
11	Supplying and fixing C.I.steps.	1				24.53	25.00	nos
12	Colour washing two coats over one coat of white washing							m2
a)	well outer	1	3.14	7.20	1.00	22.61		
b)	top of wall thickness	1	3.14	6.60	0.60	12.43		
						35.04	36.00	m2
13	Supply and installation of SS open mesh flooring with 25x6mm thick flats for outer frame and 25x3mm SS and 12x3mm SS flats spaced at 30mm and 60mm respectively and 50x10mm SS flats for mesh support and 50x50x6mm SS angle for opening forming a mesh over the surface of the well etc,complete							
	Area of pumping station	1				40.694	41.00	sq. mt
	kg of steel per sqm for							
	25 x 3 flats at 30 mm spacing	33	1	33.00		19.47		
	12 x 3 flats at 60 mm spacing	17	1	17.00		4.76		
					Total	24.23	24.23	kg
	Total area					993.43	993.43	kg
	25 x6 SS for outer frame	1				26.69	26.70	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	7.20			56.45	56.45	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	6.00			26.82	26.82	
	Misc. items for opening frame	1				10.00	10.00	
						Total	1113.40	kg
						Say	1114.00	kg

DETAILED ESTIMATE-SILT PIT - 1.5 m x 1.5 m x 1.2 m								
SL. NO	DESCRIPTION OF WORK	NO	L (m)	B (m)	D (m)	QTY	TOTAL	
1	Earth work excavation	1	2.80	2.80	1.65	12.94	13.00	cu.m
2	Sand filling	1	2.80	2.80	0.15	1.18	2.00	cu.m
3	PCC 1:3:6 , 40mm B.G	1	2.20	2.20	0.10	0.48	1.00	cu.m
4	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft	1	2.00	2.00	0.20	0.80		
		2	2.00	0.25	1.20	1.20		
		2	1.50	0.25	1.20	0.90		
	Baffle wall	1	1.50	0.10	0.95	0.14		
						3.04	4.00	cu.m
5	Steel for RCC work	1	3.0425 x 100 kg / cu.m			304.25	305.00	kg
6	Providing formwork							
	Base slab side	4	2.00		0.20	1.60		
	Inner side	4	1.50		1.20	7.20		
	Outer side	4	2.00		1.20	9.60		
	Baffle wall	2	1.50		0.95	2.85		
					Total	21.25	22.00	sq.m
7	Refilling with excavated soil							
	Total Excavation	1				12.94		
	Deduction							
	Sand filling					1.18		
	PCC	1				0.48		
	RCC	1				3.04		
	Pit Size	1	1.50	1.50	1.20	2.70		
						5.53	5.54	cu.m
8	Disposal of earth work							
	Excavation	1				12.94		
	Refilling	1				5.53		
						7.40	7.41	cu.m

ABSTRACT ESTIMATE- SILT RAISER ARRANGEMENTS			
SL. NO	DESCRIPTION OF WORK	NO. OR QTY	
1	Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.		
	From Desilting pump to silt pit		
a	100mm dia D/F CI Pipe -0.5m length	2.00	Nos.
b	100mm dia D/F CI Pipe -1.0m length	2.00	Nos.
c	100mm dia D/F CI Pipe -2.0m length	2.00	Nos.
d	100 mm dia D/F CI bend 90° bend	2.00	Nos.
e	100 mm D/F 90oDuck Foot Bend	1.00	No.
2	Supplying and laying 100 mm dia CI D/F pipe - 2m length including earthwork excavation in all kinds of soil, including refilling the excavated earth etc. complete.	2	nos.
3	Making flanged joints -100 mm dia including cost of jointing materials	11.00	nos.
4	Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.	10	m
5	Supplying and erection of of desilting pump (including Stsnd by)		

DETAILED ESTIMATE VALVE CHAMBER - 2.3 m x 3.8 m x 1.9 m								
SL. NO	DESCRIPTION OF WORK	NO	L (m)	B (m)	D (m)	QTY	TOTAL	
1	Earth work excavation	1	3.70	5.20	2.35	45.21	46.00	cu.m
2	Sand filling	1	3.70	5.20	0.15	2.89	3.00	cu.m
3	PCC 1:3:6, 40mm B.G with SRC	1	3.30	4.80	0.10	1.58	2.00	cu.m
4	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft							
	Raft	1	3.10	4.60	0.20	2.85		
	Walls	2	2.70	0.20	1.90	2.05		
		2	3.80	0.20	1.90	2.89		
						7.79	8.00	cu.m
5	Steel for RCC work	1	7.792 x 100 kg / cu.m			779.20	780.00	kg
6	Precast slab in Cement Concrete 1:2:4 using 12-20mm BG jelly for reinforced cement concrete works including cost of steel, centering, shuttering and cost of steel reinforcement and including laying in position, compacting, curing, finishing, etc., complete.	1	2.70	4.20	0.18	1.98	2.00	cu.m
7	Providing formwork							
	Raft	2	3.10		0.20	1.24		
		2		4.60	0.20	1.84		
	Walls outer	2	2.70		1.90	10.26		
		2		4.20	1.90	15.96		
	Walls inner	2	2.30		1.90	8.74		
		2		3.80	1.90	14.44		
					Total	52.48	53.00	sq.m
8	Refilling with excavated soil							
	Total Excavation	1				45.21		
	Deduction							
	PCC	1				1.58		
	Sand filling	1				2.89		
	RCC	1				7.79		
	Chamber Size	1	2.30	3.80	1.90	16.61		
						16.35	16.35	cu.m
9	Disposal of earth work							
	Excavation	1				45.21		
	Refilling	1				16.35		
						28.87	28.87	cu.m
10	S&F CI steps	1				6	6	Nos.

MEASUREMENT SHEET -RCC COLUMN & ISMB								
SR.NO	DESCRIPTION OF WORK	NO	LEN	WIDTH	DEPTH	QTY	TOTAL	
1	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft upto 1.5 m from G.L							
	above G.L for column	4.00	0.30	0.30	0.50	0.18	0.20	cu.m
	1.5m to 4.5m above G.L							
	above 1.5m from G.L for column	4.00	0.30	0.30	2.50	0.90	0.90	cu.m
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including strutting upto 3m high.							
	upto 3.0m from G.L for column	16.00	0.30		2.00	9.60	9.60	sq.m
	above 3.0 m to 4.0 m	16.00	0.30		1.00	4.80	4.80	sq.m
3	Steel for RCC work	1.00	(1.08)x100 kg/ cu.m			108.00	108.00	kg
4	Plastering with CM 1:3,12mm thick							
	Side	16.00	0.30		3.00	14.40		
		4.00	0.30	0.30		0.36		
						14.76	15.00	sq.m
5	Colour washing two coats over one coat of white washing		same as plastering			14.76	15.00	sq.m
6	Supply and fixing ISMB 300mm of 42.2kg/m for 3.9m on column over screen/grit well	1.00	42.2kg/mx3.9mx1nos			164.58	170.00	kg
7	Supply and fixing ISMB 600mm of 122kg/m for 7.2m on column over suction well	1.00	122kg/mx7.2mx1nos			878.40	880.00	kg
8	Erecting with pulley block of 2T capacity	1.00				1.00	1.00	no
9	Erecting with pulley block of 1T capacity	1.00				1.00	1.00	no
10	Painting two coats with superior quality ready mixed paint	2.00	3.90		0.25	1.95		
		4.00	3.90	0.13		1.95		
		2.00	7.20		0.60	8.64		
		4.00	7.20	0.21		6.05		
						18.59	19.00	sq.m

ELANKULAM STP-Block 7								
From WW3 (Thevara well-Sump) to Cheruparambath well-Sump								
DETAILED ESTIMATE-Collection WELL (3 m dia)								
Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
1	Earth work excavation in hard stiff clay, stiff black cotton, hard red earth, shales, murum, gravel, stoney earth or earth mixed with small size boulders and hard gravely soil as per SS20B with initial lead of 10m and lift of 2m etc. complete.							
a	For 0 to 2 m depth	$\pi/4$	5.10	5.10	2.00	40.86	41.00	cu.m
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including shuttering for RCC well curb and well steining.							
	Upto 1m above and 3m below GL							
a	well Kerb - inner	1	π	3.00	0.45	4.24		
b	well Kerb - outer	1	π	4.05	1.05	13.36		
c	well Kerb - slope	1	3.00	3.38	0.71	14.22		
d	Side wall	1	π	3.45	5.90	63.95		
	Total					95.77	96.00	sq.m
3	Providing and laying in position machine batched, machine mixed and machine vibrated design mix. Sulphate resistance cement concrete of M30 grade for reinforced cement concrete structural elements under controlled water cement ratio with plasticiser using 20mm and down graded machine broken granite stone jelly excluding the cost of centering and shuttering and reinforcement but including curing, etc. as per standard specification and as directed at site.							
	Up to 1.5m Below & 1.0m above ground level							
	Side wall	1	π	0.45	5.90	28.78		
						28.78	29.00	m3
	From 1.5m to 4.5m below ground level							
	kerb	1	$((0.525*0.45)+(0.15*0.6))+((0.525*0.45)+(0.15*0.6))$			1.57	2.00	m3
	From 4.5m to 9.0m below ground level							
	Bottom Slab	1	$3.14/4 \times 3^2$		0.45	3.18	4.00	m3
4	C.C 1:1.5:3 using 20mm gauge hard broken stone jelly for PCC works using Sulphate resistance cement including laying, ramming, curing etc complete for benching and channeling as directed.							
	Benching							
i)	4.5m to 9m depth	1	3.00	3.00	0.25	1.77	2.00	m3
5	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1	3.9	16.9	kg/m	207.06	207.10	kg

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
6	Sinking of well below water level including all incidental charges using special tools and plants such as air compressor, helmet etc., complete and including baling out water.							
	3m dia well							
a	First depth of 2m					2	2.00	m
b	Second depth of 2m					1.65	1.65	m
c	Third depth of 2m					0	-	m
d	Fourth depth of 2m					0	-	m
7	Plugging the bottom of the well using C.C 1:3:6 using 40mm gauge hard broken stone jelly with 10% excess cement for plain cement concrete works including laying in layers of not more than 15cm thick including ramming curing etc complete							
i)	4.5m to 9m depth	1	3.14x3.45^2/4		0.30	2.80	2.90	m3
8	Supplying, fabricating CRS bars manufactured by Primary steel including cost of steel, binding wire, cutting, cranking and tying, in position with binding wire assembly etc complete.	1	33.5	120	kg/cum	4,023.50		
	wastage at 2.5%					101.00		
						4,124.50	4,200.00	kg

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
9	Refilling with excavated earth complying with standard specifications for filling in foundations & basement other than sand including watering & consolidating etc.,							
	Earthwork quantity					40.86		
	Total volume of the well	1	3.14/4x3.9^2		2.00	14.14		
	Total					26.72	27.00	m3
10	Disposal of surplus earth							
	Earthwork quantity	1				40.86		
	For sinking well	$\pi/4$	3.90	3.90	3.65	43.60		
	Deduct for Refilling quantity					(26.72)		
	Total					57.74	58.00	m3
11	Supplying and fixing C.I.steps.	1				19.67	20.00	nos
12	Colour washing two coats over one coat of white washing							m2
a)	well outer	1	3.14	3.90	1.00	12.25		
b)	top of wall thickness	1	3.14	3.45	0.45	4.87		
						17.12	18.00	m2
13	Supply and installation of SS open mesh flooring with 25x6mm thick flats for outer frame and 25x3mm SS and 12x3mm SS flats spaced at 30mm and 60mm respectively and 50x10mm SS flats for mesh support and 50x50x6mm SS angle for opening forming a mesh over the surface of the well etc,complete							
	Area of pumping station	1				11.940	12.00	sq. mt
	kg of steel per sqm for							
	25 x 3 flats at 30 mm spacing	33	1	33.00		19.47		
	12 x 3 flats at 60 mm spacing	17	1	17.00		4.76		
					Total	24.23	24.23	kg
	Total area					290.76	290.76	kg
	25 x6 SS for outer frame	1				14.46	14.46	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.90			30.58	30.58	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	4.60			20.56	20.57	
	Misc. items for opening frame	1				10.00	10.00	
						Total	366.37	kg
						Say	367.00	kg

ELANKULAM STP-Block 7								
From WW3 (Thevara well-Sump) to Cheruparambath well-Sump								
Detailed Estimate -SCREEN/GRIT WELL (3m dia)								
Sr. No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
1	Earth work excavation in hard stiff clay, stiff black cotton, hard red earth, shales, murum, gravel, stoney earth or earth mixed with small size boulders and hard gravelly soil as per SS20B with initial lead of 10m and lift of 2m etc. complete.							
a	For 0 to 2 m depth	$\pi/4$	5.10	5.10	2.00	40.86	41.00	cu.m
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including shuttering for RCC well curb and well steining.							
	Upto 1m above and 3m below GL							
a	well Kerb - inner	1	π	3.00	0.45	4.24		
b	well Kerb - outer	1	π	4.05	1.05	13.36		
c	well Kerb- slope	1	3.00	3.38	0.71	14.22		
d	Side wall (center)	2	π	3.45	5.20	112.72		
	Total					144.54	145.00	sq.m
3	Providing and laying in position machine batched machine mixed and machine vibrated design mix. Sulphate resistance cement concrete M30 grade for reinforced cement concrete structural elements under controlled water cement ratio with plasticiser using 20mm and down graded machine broken granite stone jelly excluding the cost of centering and shuttering and reinforcement but including curing etc. as per standard specification and as directed at site							
	Up to 1.5m Below & 1.0m above ground level							
	Side Wall	1	$\pi()$ *3.45	0.45	5.20	25.36	26.00	cu.m
	From 1.5m to 4.5m below ground level							
	kerb	1	$((0.525*0.45)+(0.15*0.6))+()$			4.86	5.00	cu.m
	From 4.5m to 9.0m below ground level							
	Bottom Slab	1	$3.14/4*3^2$		0.45	3.18	4.00	cu.m
4	C.C 1:1.5:3 using 20mm gauge hard broken stone jelly for PCC works using Sulphate resistance cement including laying, ramming, curing etc complete for benching and channeling as directed.							
	Benching							
i)	4.5m to 9m depth	1	3.00	3.00	0.25	1.77	2.00	cu.m
5	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1	3.9	16.9	kg/m	207.1	207.10	kg
6	Sinking of well below water level including all incidental charges using special tools and plants such as air compressor, helmet etc., complete and including baling out water.							
	3m dia well							
a	First depth of 2m					2	2.00	m
b	Second depth of 2m					1.25	1.25	m
c	Third depth of 2m					0	0.00	m

Sr. No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
7	Plugging the bottom of the well using C.C 1:3:6 using 40mm gauge hard broken stone jelly with 10% excess cement for plain cement concrete works including laying in layers of not more than 15cm thick including ramming curing etc complete							
i)	4.5m to 9m depth	1	3.14x3.45^2/4		0.30	2.12	2.20	cu.m
8	Supplying, fabricating CRS bars manufactured by Primary steel including cost of steel, binding wire, cutting, cranking and tying, in position with binding wire assembly etc complete.	1	33.40	120	kg/cum	4,008.20		
	wastage at 2.5%					101.00		
						4,109.20	4200.00	kg
9	Refilling with excavated earth complying with standard specifications for filling in foundations & basement other than sand including watering & consolidating etc.,							
	Earthwork quantity					40.86		
	Volume of the well	1	3.14/4x3.9^2		2.00	14.14		
	Total					26.72	27.00	cu.m
10	Disposal of surplus earth							
	Earthwork quantity	1				40.86		
	For sinking well	$\pi/4$	3.90	3.90	2.50	29.86		
	Deduct for Refilling quantity					(26.72)		
	Total					44.00	45.00	cu.m
11	Supplying and fixing C.I.steps.	1				17.33	18.00	nos
12	Colour washing two coats over one coat of white washing							sq.m
	a)well outer	1	3.14	3.90	1.00	12.25		
	b)top of wall thickness	1	3.14	3.45	0.45	4.87		
						17.12	18.00	sq.m
13	Supplying and fixing SS screen of grade 316. The screen shall be fabricated out of stainless steel flats of 50 x 10mm. The outer frame also shall be of 50 x 10mm fixed inside the well for seating the screen. The screen shall be so fabricated that the inclined portion of the screen is fixed and the horizontal portion of the screen is a removable one for lifting the pump for maintenance purpose.							
	outer frame and 50x10mm SS flats spaced at 35mm centre to centre to serve bar screens inside the screen well							
	50mmx10mm flats at 35 mm spacing	29	1			113.68		
	Area of slant screen		3m x 1.7m			5.1	sq.m	
	total weight of flats					579.77	580.00	
	50 x 10mm SS for outer frame	1	9.40			36.85	37.00	
						Total	617.00	
						Total wt of frame	617.00	Kg

Sr. No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
14	Supply and installation of SS open mesh flooring with 25x6mm thick flats for outer frame and 25x3mm SS and 12x3mm SS flats spaced at 30mm and 60mm respectively and 50x10mm SS flats for mesh support and 50x50x6mm SS angle for opening forming a mesh over the surface of the well etc,complete							
	Area of pumping station	1				11.940	12.00	sq. mt
	kg of steel per sqm for							
	25 x 3 flats at 30 mm spacing	33	1.00	33.00		19.47		
	12 x 3 flats at 60 mm spacing	17	1.00	17.00		4.76		
					Total	24.23	24.23	kg
	Total area					290.76	290.76	kg
	25 x6 SS for outer frame	1				14.46	14.46	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.90			30.58	30.58	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	1.88			8.43	8.43	
	Misc. items for opening frame	1				5.00	5.00	
						Total	349.23	kg
						Say	350.00	kg

ELANKULAM STP-Block 7								
From WW3 (Thevara well-Sump) to Cheruparambath well-Sump								
DETAILED ESTIMATE-SUCTION WELL (5 m dia)								
Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
1	Earth work excavation in hard stiff clay, stiff black cotton, hard red earth, shales, murum, gravel, stoney earth or earth mixed with small size boulders and hard gravely soil as per SS20B with initial lead of 10m and lift of 2m etc. complete.							
a	For 0 to 2 m depth	$\pi/4$	7.00	7.00	2.00	76.97	77.00	cu.m
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including shuttering for RCC well curb and well steining.							
	Upto 1m above and 3m below GL							
a	well Kerb - inner	1	π	5.00	0.60	9.42		
b	well Kerb - outer	1	π	6.35	1.33	26.43		
c	well Kerb - slope	1	5.00	5.53	0.90	29.76		
d	Side wall	2	π	5.60	6.41	225.54		
	Total					291.16	292.00	sq.m
3	Providing and laying in position machine batched, machine mixed and machine vibrated design mix. Sulphate resistance cement concrete of M30 grade for reinforced cement concrete structural elements under controlled water cement ratio with plasticiser using 20mm and down graded machine broken granite stone jelly excluding the cost of centering and shuttering and reinforcement but including curing, etc. as per standard specification and as directed at site.							
	Up to 1.5m Below & 1.0m above ground level							
	Side wall	1	π	0.60	6.41	67.66		
						67.66	68.00	m3
	From 1.5m to 4.5m below ground level							
	kerb	1	$((0.675*0.6)+(0.15*0.725))$			3.91	4.00	m3
	From 4.5m to 9.0m below ground level							
	Bottom Slab	1	$3.14/4 \times 5^2$		0.60	11.78	12.00	m3
4	C.C 1:1.5:3 using 20mm gauge hard broken stone jelly for PCC works using Sulphate resistance cement including laying, ramming, curing etc complete for benching and channeling as directed.							
	Benching							
i)	4.5m to 9m depth	1	5.00	5.00	0.25	4.91	5.00	m3
5	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1	6.2	16.9	kg/m	329.18	329.20	kg

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
6	Sinking of well below water level including all incidental charges using special tools and plants such as air compressor, helmet etc., complete and including baling out water.							
	5m dia well							
a	First depth of 2m					2	2.00	m
b	Second depth of 2m					2	2.00	m
c	Third depth of 2m					0.735	0.74	m
d	Fourth depth of 2m					0	-	m
7	Plugging the bottom of the well using C.C 1:3:6 using 40mm gauge hard broken stone jelly with 10% excess cement for plain cement concrete works including laying in layers of not more than 15cm thick including ramming curing etc complete							
i)	4.5m to 9m depth	1	3.14x5.6^2/4		0.40	9.85	9.90	m3
8	Supplying, fabricating CRS bars manufactured by Primary steel including cost of steel, binding wire, cutting, cranking and tying, in position with binding wire assembly etc complete.	1	83.4	120	kg/cum	10,002.01		
	wastage at 2.5%					251.00		
						10,253.01	10,300.00	kg
9	Refilling with excavated earth complying with standard specifications for filling in foundations & basement other than sand including watering & consolidating etc.,							
	Earthwork quantity					76.97		
	Total volume of the well	1	3.14/4x6.2^2		2.00	39.27		
	Total					37.70	38.00	m3
10	Disposal of surplus earth							
	Earthwork quantity	1				76.97		
	For sinking well	$\pi/4$	6.20	6.20	4.74	142.95		
	Deduct for Refilling quantity					(37.70)		
	Total					182.22	183.00	m3

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
11	Supplying and fixing C.I.steps.	1				21.37	22.00	nos
12	Colour washing two coats over one coat of white washing							m2
a)	well outer	1	3.14	6.20	1.00	19.47		
b)	top of wall thickness	1	3.14	5.60	0.60	10.55		
						30.02	31.00	m2
13	Supply and installation of SS open mesh flooring with 25x6mm thick flats for outer frame and 25x3mm SS and 12x3mm SS flats spaced at 30mm and 60mm respectively and 50x10mm SS flats for mesh support and 50x50x6mm SS angle for opening forming a mesh over the surface of the well etc,complete							
	Area of pumping station	1				30.175	31.00	sq. mt
	kg of steel per sqm for							
	25 x 3 flats at 30 mm spacing	33	1	33.00		19.47		
	12 x 3 flats at 60 mm spacing	17	1	17.00		4.76		
					Total	24.23	24.23	kg
	Total area					751.13	751.13	kg
	25 x6 SS for outer frame	1				22.98	22.99	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	6.20			48.61	48.61	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	5.60			25.03	25.04	
	Misc. items for opening frame	1				10.00	10.00	
						Total	857.77	kg
						Say	858.00	kg

DETAILED ESTIMATE-SILT PIT - 1.5 m x 1.5 m x 1.2 m								
SL. NO	DESCRIPTION OF WORK	NO	L (m)	B (m)	D (m)	QTY	TOTAL	
1	Earth work excavation	1	2.80	2.80	1.65	12.94	13.00	cu.m
2	Sand filling	1	2.80	2.80	0.15	1.18	2.00	cu.m
3	PCC 1:3:6 , 40mm B.G	1	2.20	2.20	0.10	0.48	1.00	cu.m
4	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft	1	2.00	2.00	0.20	0.80		
		2	2.00	0.25	1.20	1.20		
		2	1.50	0.25	1.20	0.90		
	Baffle wall	1	1.50	0.10	0.95	0.14		
						3.04	4.00	cu.m
5	Steel for RCC work	1	3.0425 x 100 kg / cu.m			304.25	305.00	kg
6	Providing formwork							
	Base slab side	4	2.00		0.20	1.60		
	Inner side	4	1.50		1.20	7.20		
	Outer side	4	2.00		1.20	9.60		
	Baffle wall	2	1.50		0.95	2.85		
					Total	21.25	22.00	sq.m
7	Refilling with excavated soil							
	Total Excavation	1				12.94		
	Deduction							
	Sand filling					1.18		
	PCC	1				0.48		
	RCC	1				3.04		
	Pit Size	1	1.50	1.50	1.20	2.70		
						5.53	5.54	cu.m
8	Disposal of earth work							
	Excavation	1				12.94		
	Refilling	1				5.53		
						7.40	7.41	cu.m

ABSTRACT ESTIMATE- SILT RAISER ARRANGEMENTS			
SL. NO	DESCRIPTION OF WORK	NO. OR QTY	
1	Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete. From Desilting pump to silt pit		
a	100mm dia D/F CI Pipe -0.5m length	2.00	Nos.
b	100mm dia D/F CI Pipe -1.0m length	2.00	Nos.
c	100mm dia D/F CI Pipe -2.0m length	2.00	Nos.
d	100 mm dia D/F CI bend 90° bend	2.00	Nos.
e	100 mm D/F 90oDuck Foot Bend	1.00	No.
2	Supplying and laying 100 mm dia CI D/F pipe - 2m length including earthwork excavation in all kinds of soil, including refilling the excavated earth etc. complete.	2	nos.
3	Making flanged joints -100 mm dia including cost of jointing materials	11.00	nos.
4	Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.	10	m
5	Supplying and erection of of desilting pump (including Stsnd by)		

DETAILED ESTIMATE VALVE CHAMBER - 2.3 m x 3.8 m x 1.9 m								
SL. NO	DESCRIPTION OF WORK	NO	L (m)	B (m)	D (m)	QTY	TOTAL	
1	Earth work excavation	1	3.70	5.20	2.35	45.21	46.00	cu.m
2	Sand filling	1	3.70	5.20	0.15	2.89	3.00	cu.m
3	PCC 1:3:6, 40mm B.G with SRC	1	3.30	4.80	0.10	1.58	2.00	cu.m
4	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft							
	Raft	1	3.10	4.60	0.20	2.85		
	Walls	2	2.70	0.20	1.90	2.05		
		2	3.80	0.20	1.90	2.89		
						7.79	8.00	cu.m
5	Steel for RCC work	1	7.792 x 100 kg / cu.m			779.20	780.00	kg
6	Precast slab in Cement Concrete 1:2:4 using 12-20mm BG jelly for reinforced cement concrete works including cost of steel, centering, shuttering and cost of steel reinforcement and including laying in position, compacting, curing, finishing, etc., complete.	1	2.70	4.20	0.18	1.98	2.00	cu.m
7	Providing formwork							
	Raft	2	3.10		0.20	1.24		
		2		4.60	0.20	1.84		
	Walls outer	2	2.70		1.90	10.26		
		2		4.20	1.90	15.96		
	Walls inner	2	2.30		1.90	8.74		
		2		3.80	1.90	14.44		
					Total	52.48	53.00	sq.m
8	Refilling with excavated soil							
	Total Excavation	1				45.21		
	Deduction							
	PCC	1				1.58		
	Sand filling	1				2.89		
	RCC	1				7.79		
	Chamber Size	1	2.30	3.80	1.90	16.61		
						16.35	16.35	cu.m
9	Disposal of earth work							
	Excavation	1				45.21		
	Refilling	1				16.35		
						28.87	28.87	cu.m
10	S&F CI steps	1				6	6 Nos.	

MEASUREMENT SHEET -RCC COLUMN & ISMB								
SR.NO	DESCRIPTION OF WORK	NO	LEN	WIDTH	DEPTH	QTY	TOTAL	
1	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft							
	upto 1.5 m from G.L							
	above G.L for column	4.00	0.30	0.30	0.50	0.18	0.20	cu.m
	1.5m to 4.5m above G.L							
	above 1.5m from G.L for column	4.00	0.30	0.30	2.50	0.90	0.90	cu.m
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including strutting upto 3m high.							
	upto 3.0m from G.L for column	16.00	0.30		2.00	9.60	9.60	sq.m
	above 3.0 m to 4.0 m	16.00	0.30		1.00	4.80	4.80	sq.m
3	Steel for RCC work	1.00	(1.08)x100 kg/ cu.m			108.00	108.00	kg
4	Plastering with CM 1:3,12mm thick							
	Side	16.00	0.30		3.00	14.40		
		4.00	0.30	0.30		0.36		
						14.76	15.00	sq.m
5	Colour washing two coats over one coat of white washing		same as plastering			14.76	15.00	sq.m
6	Supply and fixing ISMB 300mm of 42.2kg/m for 3.9m on column over screen/grit well	1.00	42.2kg/mx3.9mx1nos			164.58	170.00	kg
7	Supply and fixing ISMB 600mm of 122kg/m for 7.2m on column over suction well	1.00	122kg/mx7.2mx1nos			878.40	880.00	kg
8	Erecting with pulley block of 2T capacity	1.00				1.00	1.00	no
9	Erecting with pulley block of 1T capacity	1.00				1.00	1.00	no
10	Painting two coats with superior quality ready mixed paint	2.00	3.90		0.25	1.95		
		4.00	3.90	0.13		1.95		
		2.00	7.20		0.60	8.64		
		4.00	7.20	0.21		6.05		
						18.59	19.00	sq.m

ELAMKULAM STP-From WW4 (Blk.5) to IC@STP								
Detailed Estimate -SCREEN/GRIT WELL (3m dia)								
Sr. No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
1	Earth work excavation in hard stiff clay, stiff black cotton, hard red earth, shales, murum, gravel, stoney earth or earth mixed with small size boulders and hard gravely soil as per SS20B with initial lead of 10m and lift of 2m etc. complete.							
a	For 0 to 2 m depth	$\pi/4$	5.10	5.10	2.00	40.86	41.00	cu.m
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including shuttering for RCC well curb and well steining.							
	Upto 1m above and 3m below GL							
a	well Kerb - inner	1	π	3.00	0.45	4.24		
b	well Kerb - outer	1	π	4.05	1.05	13.36		
c	well Kerb- slope	1	3.00	3.38	0.71	14.22		
d	Side wall	1	π	3.90	7.10	86.99		
	Total					118.81	119.00	sq.m
3	Providing and laying in position machine batched machine mixed and machine vibrated design mix. Sulphate resistance cement concrete M30 grade for reinforced cement concrete structural elements under controlled water cement ratio with plasticiser using 20mm and down graded machine broken granite stone jelly excluding the cost of centering and shuttering and reinforcement but including curing etc. as per standard specification and as directed at site							
	Up to 1.5m Below & 1.0m above ground level							
	Side Wall	1	$\pi()$ *3.45	0.45	7.10	34.63	35.00	cu.m
	From 1.5m to 4.5m below ground level							
	kerb	1	$((0.525*0.45)+(0.15*0.6))+()$			4.86	5.00	cu.m
	From 4.5m to 9.0m below ground level							
	Bottom Slab	1	$3.14/4*3^2$		0.45	3.18	4.00	cu.m
4	C.C 1:1.5:3 using 20mm gauge hard broken stone jelly for PCC works using Sulphate resistance cement including laying, ramming, curing etc complete for benching and channeling as directed.							
	Benching							
i)	4.5m to 9m depth	1	3.00	3.00	0.25	1.77	2.00	cu.m
5	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1	3.9	16.9	kg/m	207.1	207.10	kg
6	Sinking of well below water level including all incidental charges using special tools and plants such as air compressor, helmet etc., complete and including baling out water							
	3m dia well							

Sr. No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
a	First depth of 2m					2	2.00	m
b	Second depth of 2m					2	2.00	m
c	Third depth of 2m					0.85	0.85	m
7	Plugging the bottom of the well using C.C 1:3:6 using 40mm gauge hard broken stone jelly with 10% excess cement for plain cement concrete works including laying in layers of not more than 15cm thick including ramming curing etc complete							
i)	4.5m to 9m depth	1	3.14x3.45 ² /4		0.30	2.12	2.20	cu.m
8	Supplying, fabricating CRS bars manufactured by Primary steel including cost of steel, binding wire, cutting, cranking and tying, in position with binding wire assembly etc complete.	1	42.67	120	kg/cum	5,120.23		
	wastage at 2.5%					129.00		
						5,249.23	5300.00	kg
9	Refilling with excavated earth complying with standard specifications for filling in foundations & basement other than sand including watering & consolidating etc.,							
	Earthwork quantity					40.86		
	Volume of the well	1	3.14/4x3.9 ²		2.00	14.14		
	Total					26.72	27.00	cu.m
10	Disposal of surplus earth							
	Earthwork quantity	1				40.86		
	For sinking well	$\pi/4$	3.90	3.90	4.40	52.56		
	Deduct for Refilling quantity					(26.72)		
	Total					66.70	67.00	cu.m
11	Supplying and fixing C.I.steps.	1				23.67	24.00	nos
12	Colour washing two coats over one coat of white washing							sq.m
	a)well outer	1	3.14	3.90	1.00	12.25		
	b)top of wall thickness	1	3.14	3.45	0.45	4.87		
						17.12	18.00	sq.m
13	Supplying and fixing SS screen of grade 316. The screen shall be fabricated out of stainless steel flats of 50 x 10mm. The outer frame also shall be of 50 x 10mm fixed inside the well for seating the screen. The screen shall be so fabricated that the inclined portion of the screen is fixed and the horizontal portion of the screen is a removable one for lifting the pump for maintenance purpose.							
	outer frame and 50x10mm SS flats spaced at 35mm centre to centre to serve bar screens inside the screen well							
	50mmx10mm flats at 35 mm spacing	29	1			113.68		
	Area of slant screen		3m x 1.5m			4.5	sq.m	
	total weight of flats					511.56	512.00	
	50 x 10mm SS for outer frame	1	9.00			35.28	36.00	
						Total	548.00	
						Total wt of frame	548.00	Kg

Sr. No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
14	Supply and installation of SS open mesh flooring with 25x6mm thick flats for outer frame and 25x3mm SS and 12x3mm SS flats spaced at 30mm and 60mm respectively and 50x10mm SS flats for mesh support and 50x50x6mm SS angle for opening forming a mesh over the surface of the well etc,complete							
	Area of pumping station	1				11.940	12.00	sq. mt
	kg of steel per sqm for							
	25 x 3 flats at 30 mm spacing	33	1.00	33.00		19.47		
	12 x 3 flats at 60 mm spacing	17	1.00	17.00		4.76		
					Total	24.23	24.23	kg
	Total area					290.76	290.76	kg
	25 x6 SS for outer frame	1				14.46	14.46	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.90			30.58	30.58	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	1.88			8.43	8.43	
	Misc. items for opening frame	1				5.00	5.00	
						Total	349.23	kg
						Say	350.00	kg

ELAMKULAM STP-From WW4 (Blk.5) to IC@STP								
DETAILED ESTIMATE-SUCTION WELL (6 m dia)								
Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
1	Earth work excavation in hard stiff clay, stiff black cotton, hard red earth, shales, murum, gravel, stoney earth or earth mixed with small size boulders and hard gravely soil as per SS20B with initial lead of 10m and lift of 2m etc. complete.							
a	For 0 to 2 m depth	$\pi/4$	8.00	8.00	2.00	100.53	101.00	cu.m
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including shuttering for RCC well curb and well steining.							
	Upto 1m above and 3m below GL							
a	well Kerb - inner	1	π	6.00	0.60	11.31		
b	well Kerb - outer	1	π	7.35	1.33	30.60		
c	well Kerb - slope	1	6.00	6.53	0.90	35.41		
d	Side wall	1	π	6.60	8.45	175.21		
	Total					252.53	253.00	sq.m
3	Providing and laying in position machine batched, machine mixed and machine vibrated design mix. Sulphate resistance cement concrete of M30 grade for reinforced cement concrete structural elements under controlled water cement ratio with plasticiser using 20mm and down graded machine broken granite stone jelly excluding the cost of centering and shuttering and reinforcement but including curing, etc. as per standard specification and as directed at site.							
	Up to 1.5m Below & 1.0m above ground level							
	Side wall	1	π	0.60	8.45	105.12		
						105.12	106.00	m3
	From 1.5m to 4.5m below ground level							
	kerb	1	$((0.675*0.6)+(0.15*0.725))$			4.50	5.00	m3
	From 4.5m to 9.0m below ground level							
	Bottom Slab	1	$3.14/4 \times 6^2$		0.60	16.96	17.00	m3
4	C.C 1:1.5:3 using 20mm gauge hard broken stone jelly for PCC works using Sulphate resistance cement including laying, ramming, curing etc complete for benching and channeling as directed.							
	Benching							

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
i)	4.5m to 9m depth	1	6.00	6.00	0.25	7.07	8.00	m3
5	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1	7.2	16.9	kg/m	382.27	382.30	kg
6	Sinking of well below water level including all incidental charges using special tools and plants such as air compressor, helmet etc., complete and including baling out water.							
	6m dia well							
a	First depth of 2m					2	2.00	m
b	Second depth of 2m					2	2.00	m
c	Third depth of 2m					2	2.00	m
d	Fourth depth of 2m					0.45	0.45	m
7	Plugging the bottom of the well using C.C 1:3:6 using 40mm gauge hard broken stone jelly with 10% excess cement for plain cement concrete works including laying in layers of not more than 15cm thick including ramming curing etc complete							
i)	4.5m to 9m depth	1	3.14x6.6^2/4		0.40	13.68	13.70	m3
8	Supplying, fabricating CRS bars manufactured by Primary steel including cost of steel, binding wire, cutting, cranking and tying, in position with binding wire assembly etc complete.	1						
			126.6	120	kg/cum	15,191.18		
	wastage at 2.5%					380.00		
						15,571.18	15,600.00	kg

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
9	Refilling with excavated earth complying with standard specifications for filling in foundations & basement other than sand including watering & consolidating etc.,							
	Earthwork quantity					100.53		
	Total volume of the well	1	3.14/4x7.2^2		2.00	56.55		
	Total					43.98	44.00	m3
10	Disposal of surplus earth							
	Earthwork quantity	1				100.53		
	For sinking well	$\pi/4$	7.20	7.20	6.45	262.61		
	Deduct for Refilling quantity					(43.98)		
	Total					319.16	320.00	m3
11	Supplying and fixing C.I.steps.	1				28.17	29.00	nos
12	Colour washing two coats over one coat of white washing							m2
a)	well outer	1	3.14	7.20	1.00	22.61		
b)	top of wall thickness	1	3.14	6.60	0.60	12.43		
						35.04	36.00	m2
13	Supply and erection of Cast Iron single faced manually operated rising type 200mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangement and hand wheel fitted in well.					1.00	1.00	no
14	Supply and installation of SS open mesh flooring with 25x6mm thick flats for outer frame and 25x3mm SS and 12x3mm SS flats spaced at 30mm and 60mm respectively and 50x10mm SS flats for mesh support and 50x50x6mm SS angle for opening forming a mesh over the surface of the well etc.complete							
	Area of pumping station	1				40.694	41.00	sq. mt
	kg of steel per sqm for							
	25 x 3 flats at 30 mm spacing	33	1	33.00		19.47		
	12 x 3 flats at 60 mm spacing	17	1	17.00		4.76		
					Total	24.23	24.23	kg
	Total area					993.43	993.43	kg
	25 x6 SS for outer frame	1				26.69	26.70	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	7.20			56.45	56.45	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	6.00			26.82	26.82	
	Misc. items for opening frame	1				10.00	10.00	
						Total	1113.40	kg
						Say	1114.00	kg

DETAILED ESTIMATE-SILT PIT - 1.5 m x 1.5 m x 1.2 m								
SL. NO	DESCRIPTION OF WORK	NO	L (m)	B (m)	D (m)	QTY	TOTAL	
1	Earth work excavation	1	2.80	2.80	1.65	12.94	13.00	cu.m
2	Sand filling	1	2.80	2.80	0.15	1.18	2.00	cu.m
3	PCC 1:3:6 , 40mm B.G	1	2.20	2.20	0.10	0.48	1.00	cu.m
4	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft	1	2.00	2.00	0.20	0.80		
		2	2.00	0.25	1.20	1.20		
		2	1.50	0.25	1.20	0.90		
	Baffle wall	1	1.50	0.10	0.95	0.14		
						3.04	4.00	cu.m
5	Steel for RCC work	1	3.0425 x 100 kg / cu.m			304.25	305.00	kg
6	Providing formwork							
	Base slab side	4	2.00		0.20	1.60		
	Inner side	4	1.50		1.20	7.20		
	Outer side	4	2.00		1.20	9.60		
	Baffle wall	2	1.50		0.95	2.85		
					Total	21.25	22.00	sq.m
7	Refilling with excavated soil							
	Total Excavation	1				12.94		
	Deduction							
	Sand filling					1.18		
	PCC	1				0.48		
	RCC	1				3.04		
	Pit Size	1	1.50	1.50	1.20	2.70		
						5.53	5.54	cu.m
8	Disposal of earth work							
	Excavation	1				12.94		
	Refilling	1				5.53		
						7.40	7.41	cu.m

ABSTRACT ESTIMATE- SILT RAISER ARRANGEMENTS			
SL. NO	DESCRIPTION OF WORK	NO. OR QTY	
1	Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.		
	From Desilting pump to silt pit		
a	100mm dia D/F CI Pipe -0.5m length	2.00	Nos.
b	100mm dia D/F CI Pipe -1.0m length	2.00	Nos.
c	100mm dia D/F CI Pipe -2.0m length	2.00	Nos.
d	100 mm dia D/F CI bend 90° bend	2.00	Nos.
e	100 mm D/F 90oDuck Foot Bend	1.00	No.
2	Supplying and laying 100 mm dia CI D/F pipe - 2m length including earthwork excavation in all kinds of soil, including refilling the excavated earth etc. complete.	2	nos.
3	Making flanged joints -100 mm dia including cost of jointing materials	11.00	nos.
4	Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.	10	m
5	Supplying and erection of of desilting pump (including Stsnd by)		

DETAILED ESTIMATE VALVE CHAMBER - 2.3 m x 3.8 m x 1.9 m								
SL. NO	DESCRIPTION OF WORK	NO	L (m)	B (m)	D (m)	QTY	TOTAL	
1	Earth work excavation	1	3.70	5.20	2.35	45.21	46.00	cu.m
2	Sand filling	1	3.70	5.20	0.15	2.89	3.00	cu.m
3	PCC 1:3:6, 40mm B.G with SRC	1	3.30	4.80	0.10	1.58	2.00	cu.m
4	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft							
	Raft	1	3.10	4.60	0.20	2.85		
	Walls	2	2.70	0.20	1.90	2.05		
		2	3.80	0.20	1.90	2.89		
						7.79	8.00	cu.m
5	Steel for RCC work	1	7.792 x 100 kg / cu.m			779.20	780.00	kg
6	Precast slab in Cement Concrete 1:2:4 using 12-20mm BG jelly for reinforced cement concrete works including cost of steel, centering, shuttering and cost of steel reinforcement and including laying in position, compacting, curing, finishing, etc., complete.	1	2.70	4.20	0.18	1.98	2.00	cu.m
7	Providing formwork							
	Raft	2	3.10		0.20	1.24		
		2		4.60	0.20	1.84		
	Walls outer	2	2.70		1.90	10.26		
		2		4.20	1.90	15.96		
	Walls inner	2	2.30		1.90	8.74		
		2		3.80	1.90	14.44		
					Total	52.48	53.00	sq.m
8	Refilling with excavated soil							
	Total Excavation	1				45.21		
	Deduction							
	PCC	1				1.58		
	Sand filling	1				2.89		
	RCC	1				7.79		
	Chamber Size	1	2.30	3.80	1.90	16.61		
						16.35	16.35	cu.m
9	Disposal of earth work							
	Excavation	1				45.21		
	Refilling	1				16.35		
						28.87	28.87	cu.m
10	S&F CI steps	1				6	6 Nos.	

MEASUREMENT SHEET -RCC COLUMN & ISMB								
SR.NO	DESCRIPTION OF WORK	NO	LEN	WIDTH	DEPTH	QTY	TOTAL	
1	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft							
	upto 1.5 m from G.L							
	above G.L for column	4.00	0.30	0.30	0.50	0.18	0.20	cu.m
	1.5m to 4.5m above G.L							
	above 1.5m from G.L for column	4.00	0.30	0.30	2.50	0.90	0.90	cu.m
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including strutting upto 2m high							
	upto 3.0m from G.L for column	16.00	0.30		2.00	9.60	9.60	sq.m
	above 3.0 m to 4.0 m	16.00	0.30		1.00	4.80	4.80	sq.m
3	Steel for RCC work	1.00	(1.08)x100 kg/ cu.m			108.00	108.00	kg
4	Plastering with CM 1:3,12mm thick							
	Side	16.00	0.30		3.00	14.40		
		4.00	0.30	0.30		0.36		
						14.76	15.00	sq.m
5	Colour washing two coats over one coat of white washing		same as plastering			14.76	15.00	sq.m
6	Supply and fixing ISMB 300mm of 42.2kg/m for 3.9m on column over screen/grit well	1.00	42.2kg/mx3.9mx1nos			164.58	170.00	kg
7	Supply and fixing ISMB 600mm of 122kg/m for 7.2m on column over suction well	1.00	122kg/mx7.2mx1nos			878.40	880.00	kg
8	Erecting with pulley block of 2T capacity	1.00				1.00	1.00	no
9	Erecting with pulley block of 1T capacity	1.00				1.00	1.00	no
10	Painting two coats with superior quality ready mixed paint	2.00	3.90		0.25	1.95		
		4.00	3.90	0.13		1.95		
		2.00	7.20		0.60	8.64		
		4.00	7.20	0.21		6.05		
						18.59	19.00	sq.m

DETAILED ESTIMATE FOR RCC LIFT MH at JTA RD M65 of Block 05							
MH depth of 4.36 m and Dia of 2.5 m							
SI No	Description	Nos	L	B	D	Quantity	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (p/4)	4	4	4.96	62.33	cum
2	Supply and filling the foundation and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (p/4)	4	4	0.15	1.88	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	4	4	0.15	1.88	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	Upto 1.5 m						
i	Cover slab	1 x (p/4)	3	3	0.25	1.77	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.25	-0.07	cum
ii	Side wall	1 x p	2.75	0.25	4.11	8.88	cum.
iii	Base slab	1 x (p/4)	3.4	3.4	0.3	2.72	cum
						13.3	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					1064	KG
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						

SI No	Description	Nos	L	B	D	Quantity	
A	Plane surface						
a	From 0m to 3.3 m						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm
						4.63	sqm
B	Curved surface						
a	From 0 m to 3.3 m						
i	Cover slab sides	1 x p	3		0.25	2.36	sqm
	Add for MH cover Sides	1 x p	0.6		0.25	0.47	sqm
ii	Side wall inner & outer sides	2 x p	2.75		4.11	71.02	sqm
iii	Base slab sides	1 x p	3.4		0.3	3.2	sqm
					Total	77.05	sqm
7	Refilling the outside of the well with excavated earth (other than sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x p	3.7	0.3	0.3	1.05	cum
ii	Side wall portion	1 x p	3.5	0.5	4.11	22.6	cum
						23.65	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x p	4		6.25	78.54	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					13.3	cum
10	Finishing with epoxy paint for steel	1 x 1	1064		0.04	42.56	sqm
11	Anticorrosive bituminous paint-outside	1 x p	3		4.36	41.09	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

DETAILED ESTIMATE FOR RCC LIFT MH at CHR RD M27L of Block 05							
MH depth of 6.01 m and Dia of 2.5 m							
SI No	Description	Nos	L	B	D	Quantity	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 3.0m, disposed earth to be levelled and neatly dressed: <u>ALL KINDS OF SOIL</u>						
a	First depth of 2 m	1 x (p/4)	4.1	4.1	6.61	87.27	cum
2	Supply and filling the foundation and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (p/4)	4.1	4.1	0.15	1.98	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	4.1	4.1	0.15	1.98	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	<u>Below GL</u>						
a	<u>Upto 1.5 m</u>						
i	Cover slab	1 x (p/4)	3.1	3.1	0.25	1.89	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.25	-0.07	cum
ii	Side wall	1 x p	2.80	0.3	5.76	15.2	cum.
iii	Base slab	1 x (p/4)	3.5	3.5	0.3	2.89	cum
						19.91	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					1592.8	KG
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						

SI No	Description	Nos	L	B	D	Quantity	
A	Plane surface						
a	From 0m to 3.3 m						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm
						4.63	sqm
B	Curved surface						
a	From 0 m to 3.3 m						
i	Cover slab sides	1 x p	3.1		0.25	2.43	sqm
	Add for MH cover Sides	1 x p	0.6		0.25	0.47	sqm
ii	Side wall inner & outer sides	2 x p	2.80		5.76	101.34	sqm
iii	Base slab sides	1 x p	3.5		0.3	3.3	sqm
					Total	107.54	sqm
7	Refilling the outside of the well with excavated earth (other than sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x p	3.8	0.3	0.3	1.07	cum
ii	Side wall portion	1 x p	3.6	0.5	5.76	32.57	cum
						33.64	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x p	4.1		6.25	80.5	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					19.91	cum
10	Finishing with epoxy paint for steel	1 x 1	1592.8		0.04	63.71	sqm
11	Anticorrosive bituminous paint-outside	1 x p	3.1		6.01	58.53	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

DETAILED ESTIMATE FOR RCC LIFT MH at MPK LN RD M3L of Block 05							
MH depth of 5 m and Dia of 3.5 m							
SI No	Description	Nos	L	B	D	Quantity	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (p/4)	5	5	5.6	109.96	cum
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (p/4)	5	5	0.15	2.95	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	5	5	0.15	2.95	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	<u>Below GL</u>						
a	<u>Upto 1.5 m</u>						
i	Cover slab	1 x (p/4)	4	4	0.25	3.14	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.25	-0.07	cum
ii	Side wall	1 x p	3.75	0.25	4.75	13.99	cum.
iii	Base slab	1 x (p/4)	4.4	4.4	0.3	4.56	cum
						21.62	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					1729.6	KG
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						

SI No	Description	Nos	L	B	D	Quantity	
A	Plane surface						
a	From 0m to 3.3 m						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (p/4)	3.50	3.5		9.62	sqm
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm
						9.34	sqm
B	Curved surface						
a	From 0 m to 3.3 m						
i	Cover slab sides	1 x p	4		0.25	3.14	sqm
	Add for MH cover Sides	1 x p	0.6		0.25	0.47	sqm
ii	Side wall inner & outer sides	2 x p	3.75		4.75	111.92	sqm
iii	Base slab sides	1 x p	4.4		0.3	4.15	sqm
					Total	119.68	sqm
7	Refilling the outside of the well with excavated earth (other than sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x p	4.7	0.3	0.3	1.33	cum
ii	Side wall portion	1 x p	4.5	0.5	4.75	33.58	cum
						34.91	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x p	5		6.25	98.17	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					21.62	cum
10	Finishing with epoxy paint for steel	1 x 1	1729.6		0.04	69.18	sqm
11	Anticorrosive bituminous paint-outside	1 x p	4		5.00	62.83	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

DETAILED ESTIMATE FOR RCC LIFT MH at PNL RD M12 of Block 08							
MH depth of 6.13 m and Dia of 2.5 m							
SI No	Description	Nos	L	B	D	Quantity	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (p/4)	4.1	4.1	6.73	88.85	cum
2	Supply and filling the foundation and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (p/4)	4.1	4.1	0.15	1.98	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	4.1	4.1	0.15	1.98	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by mechanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	Upto 1.5 m						
i	Cover slab	1 x (p/4)	3.1	3.1	0.25	1.89	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.25	-0.07	cum
ii	Side wall	1 x p	2.80	0.3	5.88	15.52	cum.
iii	Base slab	1 x (p/4)	3.5	3.5	0.3	2.89	cum
						20.23	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					1618	KG
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						

SI No	Description	Nos	L	B	D	Quantity	
A	Plane surface						
a	From 0m to 3.3 m						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm
						4.63	sqm
B	Curved surface						
a	From 0 m to 3.3 m						
i	Cover slab sides	1 x p	3.1		0.25	2.43	sqm
	Add for MH cover Sides	1 x p	0.6		0.25	0.47	sqm
ii	Side wall inner & outer sides	2 x p	2.80		5.88	103.5	sqm
iii	Base slab sides	1 x p	3.5		0.3	3.3	sqm
					Total	109.7	sqm
7	Refilling the outside of the well with excavated earth (other than sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x p	3.8	0.3	0.3	1.07	cum
ii	Side wall portion	1 x p	3.6	0.5	5.88	33.25	cum
						34.32	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x p	4.1		6.25	80.5	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					20.23	cum
10	Finishing with epoxy paint for steel	1 x 1	1618		0.04	64.74	sqm
11	Anticorrosive bituminous paint-outside	1 x p	3.1		6.13	59.7	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

DETAILED ESTIMATE FOR RCC LIFT MH at VBW L M9L of Block 12A							
MH depth of 6.25 m and Dia of 3 m							
SI No	Description	Nos	L	B	D	Quantity	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (p/4)	4.6	4.6	6.85	113.84	cum
2	Supply and filling the foundation and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (p/4)	4.6	4.6	0.15	2.49	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	4.6	4.6	0.15	2.49	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	Upto 1.5 m						
i	Cover slab	1 x (p/4)	3.6	3.6	0.25	2.54	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.25	-0.07	cum
ii	Side wall	1 x p	3.30	0.3	6	18.66	cum.
iii	Base slab	1 x (p/4)	4	4	0.3	3.77	cum
						24.9	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					1992	KG
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						

A	Plane surface						
a	From 0m to 3.3 m						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (p/4)	3.00	3		7.07	sqm
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm
						6.79	sqm
B	Curved surface						
a	From 0 m to 3.3 m						
i	Cover slab sides	1 x p	3.6		0.25	2.83	sqm
	Add for MH cover Sides	1 x p	0.6		0.25	0.47	sqm
ii	Side wall inner & outer sides	2 x p	3.30		6	124.41	sqm
iii	Base slab sides	1 x p	4		0.3	3.77	sqm
					Total	131.48	sqm
7	Refilling the outside of the well with excavated earth (other than sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x p	4.3	0.3	0.3	1.22	cum
ii	Side wall portion	1 x p	4.1	0.5	6	38.64	cum
						39.86	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x p	4.6		6.25	90.32	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					24.9	cum
10	Finishing with epoxy paint for steel	1 x 1	1992		0.04	79.68	sqm
11	Anticorrosive bituminous paint-outside	1 x p	3.6		6.25	70.69	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.68			10.68	

DETAILED ESTIMATE FOR RCC LIFT MH at AH LN RD M 18.4 of Block 12A							
MH depth of 4.99 m and Dia of 2.5 m							
SI No	Description	Nos	L	B	D	Quantity	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (p/4)	4	4	5.6	70.25	cum
2	Supply and filling the foundation and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (p/4)	4	4	0.2	1.88	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	4	4	0.2	1.88	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	Upto 1.5 m						
i	Cover slab	1 x (p/4)	3	3	0.3	1.77	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.3	-0.07	cum
ii	Side wall	1 x p	2.75	0.3	4.7	10.24	cum.
iii	Base slab	1 x (p/4)	3.4	3.4	0.3	2.72	cum
						14.66	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					1172.8	KG
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						

SI No	Description	Nos	L	B	D	Quantity
A	Plane surface					
a	From 0m to 3.3 m					
	At 0.55 m height from base slab					
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91 sqm
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28 sqm
						4.63 sqm
B	Curved surface					
a	From 0 m to 3.3 m					
i	Cover slab sides	1 x p	3		0.3	2.36 sqm
	Add for MH cover Sides	1 x p	0.6		0.3	0.47 sqm
ii	Side wall inner & outer sides	2 x p	2.75		4.7	81.9 sqm
iii	Base slab sides	1 x p	3.4		0.3	3.2 sqm
					Total	87.93 sqm
7	Refilling the outside of the well with excavated earth (other than sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge					
i	Base slab portion	1 x p	3.7	0.3	0.3	1.05 cum
ii	Side wall portion	1 x p	3.5	0.5	4.7	26.06 cum
						27.11 cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.					
	0 m to 6.25 m	1 x p	4		6.3	78.54 sqm
	Above 2 m upto 4 m					
	Above 4 m upto 6 m					
9	Extra for providing sulphate resistant cement for the structures above plinth level.					14.66 cum
10	Finishing with epoxy paint for steel	1 x 1	1173		0	46.91 sqm
11	Anticorrosive bituminous paint-outside	1 x p	3		4.99	47.03 sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour charges etc complete	1 x 1				1
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.7			10.68

DETAILED ESTIMATE FOR RCC LIFT MH at SBC RD M1 of Block 12A							
MH depth of 6.06 m and Dia of 5.5 m							
SI No	Description	Nos	L	B	D	Quantity	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (p/4)	7.1	7.1	6.8	269.62	cum
2	Supply and filling the foundation and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (p/4)	7.1	7.1	0.2	5.94	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	7.1	7.1	0.2	5.94	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	Upto 1.5 m						
i	Cover slab	1 x (p/4)	6.1	6.1	0.3	8.77	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.3	-0.08	cum
ii	Side wall	1 x p	5.80	0.3	5.8	31.49	cum.
iii	Base slab	1 x (p/4)	6.5	6.5	0.5	14.93	cum
						55.11	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					4408.8	KG
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						



A	Plane surface						
a	From 0m to 3.3 m						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (p/4)	5.50	5.5		23.76	sqm
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm
						23.48	sqm
B	Curved surface						
a	From 0 m to 3.3 m						
i	Cover slab sides	1 x p	6.1		0.3	5.75	sqm
	Add for MH cover Sides	1 x p	0.6		0.3	0.57	sqm
ii	Side wall inner & outer sides	2 x p	5.80		5.8	209.91	sqm
iii	Base slab sides	1 x p	6.5		0.5	9.19	sqm
					Total	225.42	sqm
7	Refilling the outside of the well with excavated earth (other than sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x p	6.8	0.3	0.5	2.88	cum
ii	Side wall portion	1 x p	6.6	0.5	5.8	59.72	cum
						62.6	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x p	7.1		6.3	139.41	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					55.11	cum
10	Finishing with epoxy paint for steel	1 x 1	4409		0	176.35	sqm
11	Anticorrosive bituminous paint-outside	1 x p	6.1		6.06	116.13	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.7			10.68	

DETAILED ESTIMATE FOR RCC LIFT MH at AT RD MI9A of Block 07							
MH depth of 5.51 m and Dia of 2.5 m							
SI No	Description	Nos	L	B	D	Quantity	
1	Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm indepth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 3.0m, disposed earth to be levelled and neatly dressed: ALL KINDS OF SOIL						
a	First depth of 2 m	1 x (p/4)	4.1	4.1	6.1	80.67	cum
2	Supply and filling the foundatiion and basement with clear river sand in layers complying with standard specification including consolidation and watering etc. complete and as directed by Engineer -in-charge						
		1 x (p/4)	4.1	4.1	0.2	1.98	cum
3	P.C.C 1:3:6 (one cement, three sand and six coarse aggregate) using S.R. cement and 40 mm H.B.G stone including mixing concrete, laying, curing and compacting of concrete etc., complete and as directed by the Engineer -in-charge						
		1 x (p/4)	4.1	4.1	0.2	1.98	cum
4	Reinforced cement concrete M30 using S.R. cement and 20mm size hard blue granite stone (machine crushed) excluding cost of reinforcement, fabrication and placing the grills in position and excluding cost of shoring and strutting but including curing, finishing and mixing concrete using mechanical mixer machine and compaction by machanical vibrator etc., complete and as directed by Engineer -in-charge						
	Below GL						
a	Upto 1.5 m						
i	Cover slab	1 x (p/4)	3.1	3.1	0.3	1.89	cum
	Deduct for C.I manhole cover	1 x (p/4)	0.6	0.6	0.3	-0.07	cum
ii	Side wall	1 x p	2.80	0.3	5.3	13.88	cum.
iii	Base slab	1 x (p/4)	3.5	3.5	0.3	2.89	cum
						18.59	cum
5	Supplying fabricating and placing in position of RTS grills at all heights for reinforcement including cost of steel for all works and labour charges including cost of binding wire etc., complete for all RCC works and as directed by Engineer -in-charge						
	@ 80 kg/cum of RCC volume					1487.2	KG
6	Supply and erection of steel centering, shuttering for soffits and sides including necessary supports and strutting for all RCC works using MS sheets of suitable size of BG 10 stiffened with MS angle of size 25 X 25 X 3mm for boarding laid over Silver Oak joists of size 10cm X 6.5cm spaced at 90cm c/c and supported by Casuarina Props 10cm - 13cm spaced at 75cm c/c etc., complete and as directed by Engineer -in-charge(Retrieved Materials should be taken back by the contractor.)						

A	Plane surface						
a	From 0m to 3.3 m						
	At 0.55 m height from base slab						
	Cover slab bottom	1 x (p/4)	2.50	2.5		4.91	sqm
	Deduct for manhole cover	1 x (p/4)	0.6	0.6		-0.28	sqm
						4.63	sqm
B	Curved surface						
a	From 0 m to 3.3 m						
i	Cover slab sides	1 x p	3.1		0.3	2.43	sqm
	Add for MH cover Sides	1 x p	0.6		0.3	0.47	sqm
ii	Side wall inner & outer sides	2 x p	2.80		5.3	92.54	sqm
iii	Base slab sides	1 x p	3.5		0.3	3.3	sqm
					Total	98.74	sqm
7	Refilling the outside of the well with excavated earth (other than sand) complying with standard specification for filling the foundation including watering consolidation etc., complete as directed by the Engineer -in-charge						
i	Base slab portion	1 x p	3.8	0.3	0.3	1.07	cum
ii	Side wall portion	1 x p	3.6	0.5	5.3	29.74	cum
						30.81	cum
8	Shoring & strutting the sides of trench when depth of excavation exceeds 2 m in loose soil including cost of materials and labour charges for installation & removal of Silver Oak planks of 40mm thick & country wood scantlings of 4m length etc complete & as directed by the Engineer-in-Charge.						
	0 m to 6.25 m	1 x p	4.1		6.3	80.5	sqm
	Above 2 m upto 4 m						
	Above 4 m upto 6 m						
9	Extra for providing sulphate resistant cement for the structures above plinth level.					18.59	cum
10	Finishing with epoxy paint for steel	1 x 1	1487		0	59.49	sqm
11	Anticorrosive bituminous paint-outside	1 x p	3.1		5.51	53.66	sqm
12	Supplying and fixing 600mm dia FRC manhole cover to suit 600 mm clear opening manhole frame(Extra Heavy duty) charges including all cost, labour chargesetc complete	1 x 1				1	
13	Fencing one side trenches ,1.50m height with two rows of 10 cm plastic caution tape in vertical casurina pole (girth 15 cm to 24 cm)fixed at 2m intervals(data prepared based on PWD SDB -item No. 1009)	1 x 1	10.7			10.68	

ANNEXURE 5

ESTIMATES -STP

Consultant: 	ANNEXURE 5 ESTIMATES	Project: IURWTS	Client: 
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Sewerage Scheme- Construction of wet well 5 (at STP site) , Grit /Screen Chamber and connected works at Elamkulam STP

General Abstract

(Dsr year: **2018**, Cost Index Applied for this estimate is **35.59%**)

SI No	Heading Description	Amount
1	Colletion well 3m dia	1336936.42
2	Grit/Screen Chamber 3m dia	1530112.83
3	Silt Pit 1.5mx1.5mx1.2m	92142.71
4	Valve chamber 1.5mx3.4mx1.52m	188825.65
5	SILT RAISER ARRANGEMENTS	40132.64
6	Pumpsets, Pumping main, Interconnections and other connected works	484406.60
7	Construction of Column & Erection of ISMB	51686.51
8	Providing Odour control mechanism for well at STP site including supplying, installation commissioning electrical and civil works factory test etc complete all as per directions of Engineer in charge	675000.00
Provision for GST payments (in %) @		0.0%
Amount reserved for GST payments		0.00
Total		4399243.00
Lumpsum for round off		0.00
		TOTAL Rs 4399243.00
		Rounded Total Rs 43,99,243
		Rupees Forty Three Lakh Ninety Nine Thousand Two Hundred and Forty Three Only

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE

Sewerage Scheme- Construction of wet well 5 (at STP site) , Grit /Screen Chamber and connected works at Elamkulam STP

Abstract Estimate

(Dsr year: **2018**, Cost Index Applied for this estimate is **35.59%**)

1 Colletion well 3m dia		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		39.251 cum
Say 39.251 cum @ Rs 214.03 / cum		Rs 8400.89
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		9.813 cum
Say 9.813 cum @ Rs 106.37 / cum		Rs 1043.81
3	od236202/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 1.5m to 3m (R1)	
Net Total Quantity		1.000 metre
Say 1.000 metre @ Rs 13800.23 / metre		Rs 13800.23
4	od236226/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 3m to 4.5m (R1)	
Net Total Quantity		1.500 metre
Say 1.500 metre @ Rs 14621.31 / metre		Rs 21931.97
5	od236235/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 4.5m to 6.0m (R1)	
Net Total Quantity		1.500 metre
Say 1.500 metre @ Rs 15442.39 / metre		Rs 23163.59

6	od236257/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)	
Net Total Quantity		1.500 metre
Say 1.500 metre @ Rs 16674.35 / metre		Rs 25011.52
7	od236259/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 7.5m to 9m(R1)	
Net Total Quantity		0.240 metre
Say 0.240 metre @ Rs 17085.67 / metre		Rs 4100.56
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		198.429 sqm
Say 198.429 sqm @ Rs 249.69 / sqm		Rs 49545.74
9	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		37.363 cum
Say 37.363 cum @ Rs 9413.54 / cum		Rs 351718.10
10	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
Net Total Quantity		4.875 cum
Say 4.875 cum @ Rs 11065.64 / cum		Rs 53944.99

11	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		42.238 cum
Say 42.238 cum @ Rs 82.10 / cum		Rs 3467.74
12	od235904/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		42.238 cum
Say 42.238 cum @ Rs 1916.05 / cum		Rs 80930.12
13	4.1.2 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:1/2:3 (cement : 11/2 coarse sand : 3 graded stone aggregate 20 mm nominal size)	
Net Total Quantity		1.767 cum
Say 1.767 cum @ Rs 8487.46 / cum		Rs 14997.34
14	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		206.958 kilogram
Say 206.958 kilogram @ Rs 101.29 / kilogram		Rs 20962.78
15	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		2.804 cum
Say 2.804 cum @ Rs 7211.15 / cum		Rs 20220.06
16	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		5195.202 kilogram
Say 5195.202 kilogram @ Rs 98.30 / kilogram		Rs 510688.36
17	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
Net Total Quantity		259.761 sqm
Say 259.761 sqm @ Rs 223.32 / sqm		Rs 58009.83

18	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		15.372 cum
Say 15.372 cum @ Rs 258.57 / cum		Rs 3974.74
19	od235906/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
Net Total Quantity		92.414 cum
Say 92.414 cum @ Rs 606.82 / cum		Rs 56078.66
20	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
Net Total Quantity		26.000 each
Say 26.000 each @ Rs 545.00 / each		Rs 14170.00
21	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whitening	
Net Total Quantity		17.121 sqm
Say 17.121 sqm @ Rs 45.29 / sqm		Rs 775.41
2 Grit/Screen Chamber 3m dia		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		40.836 cum
Say 40.836 cum @ Rs 214.03 / cum		Rs 8740.13
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		10.209 cum

Say 10.209 cum @ Rs 106.37 / cum		Rs 1085.93
3	od235894/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m	
Net Total Quantity		1.000 metre
Say 1.000 metre @ Rs 10859.75 / metre		Rs 10859.75
4	od235897/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m	
Net Total Quantity		1.500 metre
Say 1.500 metre @ Rs 11469.39 / metre		Rs 17204.09
5	od235901/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m	
Net Total Quantity		0.800 metre
Say 0.800 metre @ Rs 12078.90 / metre		Rs 9663.12
6	5.9.12 Centering and shuttering including strutting, etc. and removal of form for: Well steining	
Net Total Quantity		168.313 sqm
Say 168.313 sqm @ Rs 249.69 / sqm		Rs 42026.07
7	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work upto plinth level	
Net Total Quantity		33.892 cum
Say 33.892 cum @ Rs 9413.54 / cum		Rs 319043.70

8	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
Net Total Quantity		4.875 cum
Say 4.875 cum @ Rs 11065.64 / cum		Rs 53944.99
9	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		38.767 cum
Say 38.767 cum @ Rs 82.10 / cum		Rs 3182.77
10	od235904/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		38.767 cum
Say 38.767 cum @ Rs 1916.05 / cum		Rs 74279.51
11	4.1.2 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:1/2:3 (cement : 11/2 coarse sand : 3 graded stone aggregate 20 mm nominal size)	
Net Total Quantity		1.767 cum
Say 1.767 cum @ Rs 8487.46 / cum		Rs 14997.34
12	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		206.958 kilogram
Say 206.958 kilogram @ Rs 101.29 / kilogram		Rs 20962.78
13	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		2.120 cum
Say 2.120 cum @ Rs 7211.15 / cum		Rs 15287.64

14	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric	
Net Total Quantity		4768.028 kilogram
Say 4768.028 kilogram @ Rs 108.47 / kilogram		Rs 517188.00
15	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
Net Total Quantity		242.216 sqm
Say 242.216 sqm @ Rs 223.32 / sqm		Rs 54091.68
16	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		26.706 cum
Say 26.706 cum @ Rs 258.57 / cum		Rs 6905.37
17	od235906/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
Net Total Quantity		57.138 cum
Say 57.138 cum @ Rs 606.82 / cum		Rs 34672.48
18	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
Net Total Quantity		21.000 each
Say 21.000 each @ Rs 545.00 / each		Rs 11445.00
19	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whitening	
Net Total Quantity		17.121 sqm
Say 17.121 sqm @ Rs 45.29 / sqm		Rs 775.41

20	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		546.841 kg
Say 546.841 kg @ Rs 119.79 / kg		Rs 65506.08
21	od247108/2022_2023 Supply and erection of Cast Iron single faced manually operated rising type "&'Input Data-2'!G10&"mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangment and hand wheel fitted in well	
Net Total Quantity		1.000 set
Say 1.000 set @ Rs 248251.00 / set		Rs 248251.00
3 Silt Pit 1.5mx1.5mx1.2m		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		12.936 cum
Say 12.936 cum @ Rs 214.03 / cum		Rs 2768.69
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
Net Total Quantity		1.176 cum
Say 1.176 cum @ Rs 2298.93 / cum		Rs 2703.54
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		0.485 cum
Say 0.485 cum @ Rs 7211.15 / cum		Rs 3497.41
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	

Net Total Quantity		3.043 cum
Say 3.043 cum @ Rs 9413.54 / cum		Rs 28645.40
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		3.043 cum
Say 3.043 cum @ Rs 82.10 / cum		Rs 249.83
6	od235904/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		3.043 cum
Say 3.043 cum @ Rs 1916.05 / cum		Rs 5830.54
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		304.300 kilogram
Say 304.300 kilogram @ Rs 98.30 / kilogram		Rs 29912.69
8	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On steel work	
Net Total Quantity		15.459 sqm
Say 15.459 sqm @ Rs 223.32 / sqm		Rs 3452.30
9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for: Well steining	
Net Total Quantity		21.250 sqm
Say 21.250 sqm @ Rs 249.69 / sqm		Rs 5305.91
10	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
Net Total Quantity		9.600 sqm
Say 9.600 sqm @ Rs 401.21 / sqm		Rs 3851.62
11	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		5.533 cum
Say 5.533 cum @ Rs 258.57 / cum		Rs 1430.67

12	od235906/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
Net Total Quantity		7.406 cum
Say 7.406 cum @ Rs 606.82 / cum		Rs 4494.11
4 Valve chamber 1.5mx3.4mx1.52m		
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil	
Net Total Quantity		27.144 cum
Say 27.144 cum @ Rs 214.03 / cum		Rs 5809.63
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil	
Net Total Quantity		6.264 cum
Say 6.264 cum @ Rs 106.37 / cum		Rs 666.30
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.	
Net Total Quantity		2.088 cum
Say 2.088 cum @ Rs 2298.93 / cum		Rs 4800.17
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		1.100 cum
Say 1.100 cum @ Rs 7211.15 / cum		Rs 7932.27
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level	
Net Total Quantity		6.414 cum
Say 6.414 cum @ Rs 9413.54 / cum		Rs 60378.45

6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		6.414 cum
Say 6.414 cum @ Rs 82.10 / cum		Rs 526.59
7	od235904/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		6.414 cum
Say 6.414 cum @ Rs 1916.05 / cum		Rs 12289.54
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		641.400 kilogram
Say 641.400 kilogram @ Rs 98.30 / kilogram		Rs 63049.62
9	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
Net Total Quantity		32.070 sqm
Say 32.070 sqm @ Rs 223.32 / sqm		Rs 7161.87
10	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		34.401 sqm
Say 34.401 sqm @ Rs 249.69 / sqm		Rs 8589.59
11	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide	
Net Total Quantity		11.400 metre
Say 11.400 metre @ Rs 203.93 / metre		Rs 2324.80
12	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.	
Net Total Quantity		11.191 cum
Say 11.191 cum @ Rs 258.57 / cum		Rs 2893.66

13	od235906/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer	
Net Total Quantity		15.949 cum
Say 15.949 cum @ Rs 606.82 / cum		Rs 9678.17
14	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design	
Net Total Quantity		5.000 each
Say 5.000 each @ Rs 545.00 / each		Rs 2725.00
5 SILT RAISER ARRANGEMENTS		
1	18.71.1 Providing and laying Double Flanged (screwed / welded) Centrifugally (Spun) Cast Iron, Class B (IS : 1536):100 mm dia C.I Double Flanged Pipe	
Net Total Quantity		7.000 metre
Say 7.000 metre @ Rs 2150.66 / metre		Rs 15054.62
2	od235893/2022_2023 Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm D/F 90oDuck Foot Bend	
Net Total Quantity		1.000 each
Say 1.000 each @ Rs 3028.03 / each		Rs 3028.03
3	od235896/2022_2023 Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm dia D/F CI bend 90o bend	
Net Total Quantity		2.000 each
Say 2.000 each @ Rs 2118.58 / each		Rs 4237.16
4	od235899/2022_2023 Supplying and layinh 100mm dia CI D/F pipe -2m length including earthwork excavation in all kinds of soil including refilling the excavated earth etc complete	
Net Total Quantity		2.000 each
Say 2.000 each @ Rs 4629.76 / each		Rs 9259.52

5	18.30.2 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:100 mm diameter pipe	
Net Total Quantity		11.000 no
Say 11.000 no @ Rs 311.92 / no		Rs 3431.12
6	od235903/2022_2023 Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.	
Net Total Quantity		10.000 metre
Say 10.000 metre @ Rs 512.22 / metre		Rs 5122.20
6 Pumpsets, Pumping main,Interconnections and other connected works		
1	od236577/2022_2023 Supplying and laying 150mm Ductile pipes class K9 including cost of all materials , earthwork excavations and backfilling after completion of the work, jointing , testing , cost for pipes and specials etc complete all as per the direction of Engineeer in charge	
Net Total Quantity		50.000 metre
Say 50.000 metre @ Rs 3171.54 / metre		Rs 158577.00
2	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)	
Net Total Quantity		1.260 cum
Say 1.260 cum @ Rs 7211.15 / cum		Rs 9086.05
3	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining	
Net Total Quantity		3.150 sqm
Say 3.150 sqm @ Rs 249.69 / sqm		Rs 786.52

4	od236603/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 5 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years	
Net Total Quantity		3.000 each set
Say 3.000 each set @ Rs 105319.01 / each set		Rs 315957.03
7 Construction of Column & Erection of ISMB		
1	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level	
Net Total Quantity		0.360 cum
Say 0.360 cum @ Rs 11065.64 / cum		Rs 3983.63
2	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).	
Net Total Quantity		0.360 cum
Say 0.360 cum @ Rs 82.10 / cum		Rs 29.56
3	od242992/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.	
Net Total Quantity		0.360 cum
Say 0.360 cum @ Rs 1916.05 / cum		Rs 689.78
4	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts	
Net Total Quantity		6.000 sqm
Say 6.000 sqm @ Rs 863.64 / sqm		Rs 5181.84

5	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more	
Net Total Quantity		36.000 kilogram
Say 36.000 kilogram @ Rs 98.30 / kilogram		Rs 3538.80
6	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work	
Net Total Quantity		11.162 sqm
Say 11.162 sqm @ Rs 223.32 / sqm		Rs 2492.70
7	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)	
Net Total Quantity		7.380 sqm
Say 7.380 sqm @ Rs 401.21 / sqm		Rs 2960.93
8	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting	
Net Total Quantity		7.380 sqm
Say 7.380 sqm @ Rs 45.29 / sqm		Rs 334.24
9	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	
Net Total Quantity		164.580 kg
Say 164.580 kg @ Rs 119.79 / kg		Rs 19715.04
10	od247075/2022_2023 Charges for chain pulley block with travelling trolley of 1 Tonne capacity	
Net Total Quantity		1.000 each
Say 1.000 each @ Rs 12760.00 / each		Rs 12760.00
8 Providing Odour control mechanism for well at STP site including supplying,installation commissioning electrical and civil works factory test etc complete all as per directions of Engineer in charge		
Lump-Sum Total		Rs 675000.00
	Provision for GST payments (in %) @	0.0%
Amount reserved for GST payments		0.00
Total		4399243.00
Lumpsum for round off		0.00

TOTAL Rs 4399243.00
Rounded Total Rs 43,99,243
Rupees Forty Three Lakh Ninety Nine Thousand Two Hundred and Forty Three Only

(Cost Index Applied for this estimate is 35.59%)



Other Engineering Organisations

PRICE

Sewerage Scheme- Construction of wet well 5 (at STP site) , Grit /Screen Chamber and connected works at Elamkulam STP

Detailed Estimate

(Dsr year: **2018**, Cost Index Applied for this estimate is **35.59%**)

Sl No	Description	No	L	B	D	CF	Quantity	Remark
1 Colletion well 3m dia								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	First depth 0 to 1.5m	3.14/4	5.000	5.000	1.500		29.438	
	Second depth 1.5m to 2m	3.14/4	5.000	5.000	0.500		9.813	
	Total Quantity						39.251 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						39.251 cum	
	Say 39.251 cum @ Rs 214.03 / cum						Rs 8400.89	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
	For Earth work 1.5m to 2m	1*3.14/4	5.000	5.000	0.500		9.813	
	Total Quantity						9.813 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						9.813 cum	
	Say 9.813 cum @ Rs 106.37 / cum						Rs 1043.81	
3	od236202/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 1.5m to 3m (R1)							
		1			1.000		1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 13800.23 / metre						Rs 13800.23	

4	od236226/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 3m to 4.5m (R1)							
		1			1.500		1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 14621.31 / metre						Rs 21931.97	
5	od236235/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 4.5m to 6.0m (R1)							
		1			1.500		1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 15442.39 / metre						Rs 23163.59	
6	od236257/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)							
		1			1.500		1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 16674.35 / metre						Rs 25011.52	
7	od236259/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 7.5m to 9m(R1)							
		1			0.240		0.240	
	Total Quantity						0.240 metre	

	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.240 metre	
	Say 0.240 metre @ Rs 17085.67 / metre						Rs 4100.56	
8	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	well Kerb	3.14	3.000	0.450			4.240	((0.525*0.45)+(0.15*0.6)+(0.5*(0.525-0.15)*0.6))*11.1
		3.14	4.050	1.050			13.353	
		3.14	3+3.38	0.710			14.224	
	Side wall	3.14*2	3.450		7.690		166.612	
	Total Quantity						198.429 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						198.429 sqm	
	Say 198.429 sqm @ Rs 249.69 / sqm						Rs 49545.74	
9	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	3.000	3.000	0.450		3.180	
	From 1.5m to 4.5m below ground level-kerb	1.57					1.570	((1.08*1)+(0.25*(1.1)+(0.5*(1.08-0.25)*(1.1)*25.37))
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	3.450	0.450	6.690		32.613	
	Total Quantity						37.363 cum	

	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						37.363 cum	
	Say 37.363 cum @ Rs 9413.54 / cum						Rs 351718.10	
10	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level							
	Side wall	3.14	3.450	0.450	1.000		4.875	
	Total Quantity						4.875 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						4.875 cum	
	Say 4.875 cum @ Rs 11065.64 / cum						Rs 53944.99	
11	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	3.000	3.000	0.450		3.180	
	From 1.5m to 4.5m below ground level-kerb	1.57					1.570	$((1.08*1)+(0.25*(1.1)+(0.5*(1.08-0.25)*(1.1)*25.37))$
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	3.450	0.450	6.690		32.613	
	Side wall	3.14	3.450	0.450	1.000		4.875	
	Total Quantity						42.238 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						42.238 cum	
	Say 42.238 cum @ Rs 82.10 / cum						Rs 3467.74	
12	od235904/2022 2023							

	Extra for providing sulphate resistant cement for the structures above plinth level.							
	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	3.000	3.000	0.450		3.180	
	From 1.5m to 4.5m below ground level-kerb	1.57					1.570	$((1.08*1)+(0.25*(1.1)+(0.5*(1.08-0.25)*(1.1)*25.37))$
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	3.450	0.450	6.690		32.613	
	Side wall	3.14	3.450	0.450	1.000		4.875	
	Total Quantity						42.238 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						42.238 cum	
	Say 42.238 cum @ Rs 1916.05 / cum						Rs 80930.12	
13	4.1.2 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:1/2:3 (cement : 1 1/2 coarse sand : 3 graded stone aggregate 20 mm nominal size)							
	Benching	3.14/4	3.000	3.000	0.250		1.767	
	Total Quantity						1.767 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.767 cum	
	Say 1.767 cum @ Rs 8487.46 / cum						Rs 14997.34	
14	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	3.900	16.900			206.958	
	Total Quantity						206.958 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						206.958 kilogram	
	Say 206.958 kilogram @ Rs 101.29 / kilogram						Rs 20962.78	

15	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging bottom	3.14/4	3.450	3.450	0.300		2.804	
	Total Quantity						2.804 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.804 cum	
	Say 2.804 cum @ Rs 7211.15 / cum						Rs 20220.06	
16	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	Wastage @2.5%	5071.15			2.5/100		126.779	
	From 4.5m to 9.0m below ground level-bottom slab	3.14/4	3.000	3.000	0.450	120.0	381.510	
	From 1.5m to 4.5m below ground level-kerb	1.57				120.0	188.400	$((1.08*1)+(0.25*(1.1)+(0.5*(1.08-0.25)*(1.1)*25.37))$
	Up to 1.5m Below & 1.0m above ground level-Side wall	3.14	3.450	0.450	6.690	120.0	3913.530	
	Side wall	3.14	3.450	0.450	1.000	120.0	584.983	
	Total Quantity						5195.202 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						5195.202 kilogram	
	Say 5195.202 kilogram @ Rs 98.30 / kilogram						Rs 510688.36	
17	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		5195.202				0.05	259.761	0.0508 m2/kg
	Total Quantity						259.761 sqm	
	Total Deducted Quantity						0.000 sqm	

	Net Total Quantity						259.761 sqm	
	Say 259.761 sqm @ Rs 223.32 / sqm						Rs 58009.83	
18	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total volume of the well	1*3.14/4	3.900	3.900	2.000		-23.879	
	First depth 0 to 1.5m	3.14/4	5.000	5.000	1.500		29.438	
	Second depth 1.5m to 2m	3.14/4	5.000	5.000	0.500		9.813	
	Total Quantity						39.251 cum	
	Total Deducted Quantity						-23.879 cum	
	Net Total Quantity						15.372 cum	
	Say 15.372 cum @ Rs 258.57 / cum						Rs 3974.74	
19	od235906/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	First depth 0 to 1.5m	3.14/4	5.000	5.000	1.500		29.438	
	Second depth 1.5m to 2m	3.14/4	5.000	5.000	0.500		9.813	
	For sinking well	3.14/4	3.900	3.900	5.740		68.535	
	Deduct for Refilling quantity	15.372					-15.372	
	Total Quantity						107.786 cum	
	Total Deducted Quantity						-15.372 cum	
	Net Total Quantity						92.414 cum	
	Say 92.414 cum @ Rs 606.82 / cum						Rs 56078.66	
20	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		26					26.000	

	Total Quantity						26.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						26.000 each	
	Say 26.000 each @ Rs 545.00 / each						Rs 14170.00	
21	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	Well outer 1m above GL)	1*3.14	3.900	1.000			12.246	
	top of wall thickness	1*3.14	3.450	0.450			4.875	
	Total Quantity						17.121 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						17.121 sqm	
	Say 17.121 sqm @ Rs 45.29 / sqm						Rs 775.41	
SI No	Description	No	L	B	D	CF	Quantity	Remark
2 Grit/Screen Chamber 3m dia								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
	For 0 to 1.5 m	1*3.14/4	5.100	5.100	1.500		30.627	
	For 1.5m to 2 m	1*3.14/4	5.100	5.100	0.500		10.209	
	Total Quantity						40.836 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						40.836 cum	
	Say 40.836 cum @ Rs 214.03 / cum						Rs 8740.13	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
	For 1.5m to 2m	1*3.14/4	5.100	5.100	0.500		10.209	
	Total Quantity						10.209 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						10.209 cum	
	Say 10.209 cum @ Rs 106.37 / cum						Rs 1085.93	
3	od235894/2022_2023							

	Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m							
		1	1.000				1.000	
	Total Quantity						1.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.000 metre	
	Say 1.000 metre @ Rs 10859.75 / metre						Rs 10859.75	
4	od235897/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m							
		1	1.500				1.500	
	Total Quantity						1.500 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						1.500 metre	
	Say 1.500 metre @ Rs 11469.39 / metre						Rs 17204.09	
5	od235901/2022_2023 Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m							
		1	0.800				0.800	
	Total Quantity						0.800 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						0.800 metre	
	Say 0.800 metre @ Rs 12078.90 / metre						Rs 9663.12	
6	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Well kerb inner	1*3.14	3.000	0.450			4.240	
	Well kerb outer	1*3.14	4.050	1.050			13.353	
	Well kerb Slope	1*3.14	3+3.38		0.710		14.224	
	Side wall	3.14*2	3.450	6.300			136.496	
	Total Quantity						168.313 sqm	

Total Deducted Quantity							0.000 sqm
Net Total Quantity							168.313 sqm
Say 168.313 sqm @ Rs 249.69 / sqm							Rs 42026.07
7	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work upto plinth level						
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180
	Well kerb	1	11.070	0.525	0.450		2.616
		1	11.070	0.150	0.600		0.997
		1*5	11.070	0.380	0.600		1.262
	Side Wall	3.14	3.450	0.450	5.300		25.837
Total Quantity							33.892 cum
Total Deducted Quantity							0.000 cum
Net Total Quantity							33.892 cum
Say 33.892 cum @ Rs 9413.54 / cum							Rs 319043.70
8	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately. All work above plinth level upto floor V level						
	Side wall	1*3.14	3.450	0.450	1.000		4.875
Total Quantity							4.875 cum

Total Deducted Quantity							0.000 cum
Net Total Quantity							4.875 cum
Say 4.875 cum @ Rs 11065.64 / cum							Rs 53944.99
9	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).						
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180
	Well kerb	1	11.070	0.525	0.450		2.616
		1	11.070	0.150	0.600		0.997
		1*5	11.070	0.380	0.600		1.262
	Side Wall	3.14	3.450	0.450	5.300		25.837
	Side wall	1*3.14	3.450	0.450	1.000		4.875
Total Quantity							38.767 cum
Total Deducted Quantity							0.000 cum
Net Total Quantity							38.767 cum
Say 38.767 cum @ Rs 82.10 / cum							Rs 3182.77
10	od235904/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.						
	Bottom slab	1*3.14	1.500	1.500	0.450		3.180
	Well kerb	1	11.070	0.525	0.450		2.616
		1	11.070	0.150	0.600		0.997
		1*5	11.070	0.380	0.600		1.262

	Side Wall	3.14	3.450	0.450	5.300		25.837	Circum=3.14*3.53=11.07
	Side wall	1*3.14	3.450	0.450	1.000		4.875	
	Total Quantity						38.767 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						38.767 cum	
	Say 38.767 cum @ Rs 1916.05 / cum						Rs 74279.51	
11	4.1.2 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:1/2:3 (cement : 11/2 coarse sand : 3 graded stone aggregate 20 mm nominal size)							
	Benching	1*3.14/4	3.000	3.000	0.250		1.767	
	Total Quantity						1.767 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.767 cum	
	Say 1.767 cum @ Rs 8487.46 / cum						Rs 14997.34	
12	10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1*3.14	3.900	16.900			206.958	
	Total Quantity						206.958 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						206.958 kilogram	
	Say 206.958 kilogram @ Rs 101.29 / kilogram						Rs 20962.78	
13	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	Plugging the bottom of the well	1*3.14/4	3.000	3.000	0.300		2.120	
	Total Quantity						2.120 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.120 cum	

	Say 2.120 cum @ Rs 7211.15 / cum						Rs 15287.64	
14	5.22.5 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelHard drawn steel wire fabric							
	B o t t o m slab@120kg/m3 of concrete	1*3.14	1.500	1.500	0.450	120.0	381.510	
	Well kerb@120kg/m3 of concrete	1	11.070	0.525	0.450	120.0	313.835	Circum=3.14*3.53=11.07
	@ 120 kg / m 3 of concrete	1	11.070	0.150	0.600	120.0	119.556	Circum=3.14*3.53=11.07
	@ 120 kg / m 3 of concrete	1*5	11.070	0.380	0.600	120.0	151.438	Circum=3.14*3.53=11.07
	Side Wall@120kg/m3 of concrete	3.14	3.450	0.450	5.300	120.0	3100.405	Circum=3.14*3.53=11.07
	Side wall@120kg/m3 of concrete	1*3.14	3.450	0.450	1.000	120.0	584.983	
	wastage at 2.5%	4652.01			2.5/100		116.301	
	Total Quantity						4768.028 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						4768.028 kilogram	
	Say 4768.028 kilogram @ Rs 108.47 / kilogram						Rs 517188.00	
15	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		4768.028			0.0508		242.216	
	Total Quantity						242.216 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						242.216 sqm	
	Say 242.216 sqm @ Rs 223.32 / sqm						Rs 54091.68	
16	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m							

	and lift up to 1.5 m.							
	Earthwork Qty as per item 1	1	40.836				40.836	
	Volume of well	1*3.14/4	3.000	3.000	2.000		-14.130	
	Total Quantity						40.836 cum	
	Total Deducted Quantity						-14.130 cum	
	Net Total Quantity						26.706 cum	
	Say 26.706 cum @ Rs 258.57 / cum						Rs 6905.37	
17	od235906/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Earthwork quantity	40.86					40.860	
	For sinking well	3.14/4	3.900	3.900	3.600		42.984	
	Deduct for Refilling quantity	26.706					-26.706	
	Total Quantity						83.844 cum	
	Total Deducted Quantity						-26.706 cum	
	Net Total Quantity						57.138 cum	
	Say 57.138 cum @ Rs 606.82 / cum						Rs 34672.48	
18	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		21					21.000	
	Total Quantity						21.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						21.000 each	
	Say 21.000 each @ Rs 545.00 / each						Rs 11445.00	
19	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whitening							
	Well outer	1	3.140	3.900	1.000		12.246	

	Wall top	1	3.140	3.450	0.450		4.875	
	Total Quantity						17.121 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						17.121 sqm	
	Say 17.121 sqm @ Rs 45.29 / sqm						Rs 775.41	
20	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Area of pumping station 12sqm							
	2outer frame and 50x10mm SS flats spaced at 25mm centre to centre to serve bar screens inside the screen well 50mmx10mm flats at 25 mm spacing	1	113.680	3.000	1.500		511.561	
	50 x 10mm SS for outer frame	1	9.000	3.920			35.280	
	Total Quantity						546.841 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						546.841 kg	
	Say 546.841 kg @ Rs 119.79 / kg						Rs 65506.08	
21	od247108/2022_2023 Supply and erection of Cast Iron single faced manually operated rising type "&'Input Data-2!'G10&"mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangment and hand wheel fitted in well							
		1					1.000	
	Total Quantity						1.000 set	
	Total Deducted Quantity						0.000 set	
	Net Total Quantity						1.000 set	
	Say 1.000 set @ Rs 248251.00 / set						Rs 248251.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
3 Silt Pit 1.5mx1.5mx1.2m								

1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	2.800	2.800	1.650		12.936	
		Total Quantity					12.936 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					12.936 cum	
		Say 12.936 cum @ Rs 214.03 / cum					Rs 2768.69	
2	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	2.800	2.800	0.150		1.176	
		Total Quantity					1.176 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					1.176 cum	
		Say 1.176 cum @ Rs 2298.93 / cum					Rs 2703.54	
3	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	2.200	2.200	0.100		0.485	
		Total Quantity					0.485 cum	
		Total Deducted Quantity					0.000 cum	
		Net Total Quantity					0.485 cum	
		Say 0.485 cum @ Rs 7211.15 / cum					Rs 3497.41	
4	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	

		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 9413.54 / cum						Rs 28645.40	
5	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately. Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 82.10 / cum						Rs 249.83	
6	od235904/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
		1	2.000	2.000	0.200		0.800	
		2	2.000	0.250	1.200		1.200	
		2	1.500	0.250	1.200		0.900	
	Baffle wall	1	1.500	0.100	0.950		0.143	
	Total Quantity						3.043 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						3.043 cum	
	Say 3.043 cum @ Rs 1916.05 / cum						Rs 5830.54	
7	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level Thermo - Mechanically Treated bars of grade Fe-500D or more							
	100Kg/m3 of concrete	1	3.043	100.000			304.300	
	Total Quantity						304.300 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						304.300 kilogram	

	Say 304.300 kilogram @ Rs 98.30 / kilogram						Rs 29912.69	
8	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete. On steel work							
	@0.0508sqm/kg	304.300				0.05	15.459	
	Total Quantity						15.459 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						15.459 sqm	
	Say 15.459 sqm @ Rs 223.32 / sqm						Rs 3452.30	
9	5.9.12 Centering and shuttering including strutting, etc. and removal of form for: Well steining							
	Base slab side	4	2.000		0.200		1.600	
	Inner side	4	1.500		1.200		7.200	
	Outer side	4	2.000		1.200		9.600	
	Baffle wall	2	1.500		0.950		2.850	
	Total Quantity						21.250 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						21.250 sqm	
	Say 21.250 sqm @ Rs 249.69 / sqm						Rs 5305.91	
10	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Outside	2	2.000			1.2	4.800	
		2	2.000			1.2	4.800	
	Total Quantity						9.600 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						9.600 sqm	
	Say 9.600 sqm @ Rs 401.21 / sqm						Rs 3851.62	
11	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total Excavation Item 1	1	12.936				12.936	
	Sand filling item 2	1	1.176				-1.176	

	PCC item3	1	0.485				-0.485	
	RCC item5	1	3.043				-3.043	
	Pit size	1	1.500	1.500	1.200		-2.699	
	Total Quantity						12.936 cum	
	Total Deducted Quantity						-7.403 cum	
	Net Total Quantity						5.533 cum	
	Say 5.533 cum @ Rs 258.57 / cum						Rs 1430.67	
12	od235906/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Excavation	12.936					12.936	
	deduction for Refilling	5.53					-5.530	
	Total Quantity						12.936 cum	
	Total Deducted Quantity						-5.530 cum	
	Net Total Quantity						7.406 cum	
	Say 7.406 cum @ Rs 606.82 / cum						Rs 4494.11	
SI No	Description	No	L	B	D	CF	Quantity	Remark
4 Valve chamber 1.5mx3.4mx1.52m								
1	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.All kinds of soil							
		1	2.900	4.800	1.950		27.144	
	Total Quantity						27.144 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						27.144 cum	
	Say 27.144 cum @ Rs 214.03 / cum						Rs 5809.63	
2	2.26.1 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.All kinds of soil							
		1	2.900	4.800	0.450		6.264	
	Total Quantity						6.264 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						6.264 cum	

	Say 6.264 cum @ Rs 106.37 / cum						Rs 666.30	
3	2.27 Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.							
		1	2.900	4.800	0.150		2.088	
	Total Quantity						2.088 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						2.088 cum	
	Say 2.088 cum @ Rs 2298.93 / cum						Rs 4800.17	
4	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
		1	2.500	4.400	0.100		1.100	
	Total Quantity						1.100 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.100 cum	
	Say 1.100 cum @ Rs 7211.15 / cum						Rs 7932.27	
5	5.33.1 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work upto plinth level							
	Raft	1	2.300	4.200	0.200		1.933	
	Walls	2	1.900	0.200	1.500		1.141	
		2	3.400	0.200	1.500		2.040	
	slab	1	1.900	3.800	0.180		1.300	
	Total Quantity						6.414 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						6.414 cum	
	Say 6.414 cum @ Rs 9413.54 / cum						Rs 60378.45	
6	5.34.1 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade							

	BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	Raft	1	2.300	4.200	0.200		1.933	
	Walls	2	1.900	0.200	1.500		1.141	
		2	3.400	0.200	1.500		2.040	
	slab	1	1.900	3.800	0.180		1.300	
	Total Quantity						6.414 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						6.414 cum	
	Say 6.414 cum @ Rs 82.10 / cum						Rs 526.59	
7	od235904/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	Raft	1	2.300	4.200	0.200		1.933	
	Walls	2	1.900	0.200	1.500		1.141	
		2	3.400	0.200	1.500		2.040	
	slab	1	1.900	3.800	0.180		1.300	
	Total Quantity						6.414 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						6.414 cum	
	Say 6.414 cum @ Rs 1916.05 / cum						Rs 12289.54	
8	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
	@ 100kg per m3 concrete	1	6.414	100.000			641.400	
	Total Quantity						641.400 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						641.400 kilogram	
	Say 641.400 kilogram @ Rs 98.30 / kilogram						Rs 63049.62	
9	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
	0.0508 Sqm/kg	641.4				0.05	32.070	
	Total Quantity						32.070 sqm	
	Total Deducted Quantity						0.000 sqm	

	Net Total Quantity						32.070 sqm	
	Say 32.070 sqm @ Rs 223.32 / sqm						Rs 7161.87	
10	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Raft	2	2.300		0.200		0.920	
		2		4.200	0.200		1.681	
	Walls outer	2	1.900		1.500		5.700	
		2		3.800	1.500		11.400	
	Walls inner	2	1.500		1.500		4.500	
		2		3.400	1.500		10.200	
	Total Quantity						34.401 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						34.401 sqm	
	Say 34.401 sqm @ Rs 249.69 / sqm						Rs 8589.59	
11	5.9.16.1 Centering and shuttering including strutting, etc. and removal of form for:Edges of slabs and breaks in floors and wallsUnder 20 cm wide							
	Cover slab	2	1.9+3.8				11.400	
	Total Quantity						11.400 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						11.400 metre	
	Say 11.400 metre @ Rs 203.93 / metre						Rs 2324.80	
12	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.							
	Total excavated earth Item 1	1	27.140				27.140	
	Sand filling Item 2	1	2.090				-2.090	
	PCC item 3	1	1.100				-1.100	
	RCC item 4	1	5.110				-5.110	
	Chamber size	1	1.500	3.400	1.500		-7.649	
	Total Quantity						27.140 cum	
	Total Deducted Quantity						-15.949 cum	
	Net Total Quantity						11.191 cum	

	Say 11.191 cum @ Rs 258.57 / cum						Rs 2893.66	
13	od235906/2022_2023 Conveying and disposing the excess earth and debris etc by lorry upto 25km KEIL/Bhrahmapuram as directed by the Engineer							
	Excavation	1	27.140				27.140	
	deduction for Refilling quantity	11.191					-11.191	
	Total Quantity						27.140 cum	
	Total Deducted Quantity						-11.191 cum	
	Net Total Quantity						15.949 cum	
	Say 15.949 cum @ Rs 606.82 / cum						Rs 9678.17	
14	19.16 Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design							
		5					5.000	
	Total Quantity						5.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						5.000 each	
	Say 5.000 each @ Rs 545.00 / each						Rs 2725.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
5 SILT RAISER ARRANGEMENTS								
1	18.71.1 Providing and laying Double Flanged (screwed / welded) Centrifugally (Spun) Cast Iron, Class B (IS : 1536):100 mm dia C.I Double Flanged Pipe							
	From Desilting pump to silt pit							
	100mm dia D/F CI Pipe -0.5m length	2	0.500				1.000	
	100mm dia D/F CI Pipe -1.0m length	2	1.000				2.000	
	100mm dia D/F CI Pipe -2.0m length	2	2.000				4.000	
	Total Quantity						7.000 metre	

Total Deducted Quantity								0.000 metre
Net Total Quantity								7.000 metre
Say 7.000 metre @ Rs 2150.66 / metre								Rs 15054.62
2	od235893/2022_2023 Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm D/F 90oDuck Foot Bend							
		1						1.000
Total Quantity								1.000 each
Total Deducted Quantity								0.000 each
Net Total Quantity								1.000 each
Say 1.000 each @ Rs 3028.03 / each								Rs 3028.03
3	od235896/2022_2023 Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.- 100 mm dia D/F CI bend 90o bend							
		2						2.000
Total Quantity								2.000 each
Total Deducted Quantity								0.000 each
Net Total Quantity								2.000 each
Say 2.000 each @ Rs 2118.58 / each								Rs 4237.16
4	od235899/2022_2023 Supplying and layinh 100mm dia CI D/F pipe -2m length including earthwork excavation in all kinds of soil including refilling the excavated earth etc complete							
		2						2.000
Total Quantity								2.000 each
Total Deducted Quantity								0.000 each
Net Total Quantity								2.000 each
Say 2.000 each @ Rs 4629.76 / each								Rs 9259.52
5	18.30.2 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:100 mm diameter pipe							
		11						11.000
Total Quantity								11.000 no
Total Deducted Quantity								0.000 no
Net Total Quantity								11.000 no
Say 11.000 no @ Rs 311.92 / no								Rs 3431.12

6	od235903/2022_2023 Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.							
		1	10.000				10.000	
	Total Quantity						10.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						10.000 metre	
	Say 10.000 metre @ Rs 512.22 / metre						Rs 5122.20	
SI No	Description	No	L	B	D	CF	Quantity	Remark
6 Pumpsets, Pumping main,Interconnections and other connected works								
1	od236577/2022_2023 Supplying and laying 150mm Ductile pipes class K9 including cost of all materials , earthwork excavations and backfilling after completion of the work, jointing , testing , cost for pipes and specials etc complete all as per the direction of Engineer in charge							
		1	50.000				50.000	
	Total Quantity						50.000 metre	
	Total Deducted Quantity						0.000 metre	
	Net Total Quantity						50.000 metre	
	Say 50.000 metre @ Rs 3171.54 / metre						Rs 158577.00	
2	4.1.6 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)							
	End concrete	2	0.630				1.260	
	Total Quantity						1.260 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						1.260 cum	
	Say 1.260 cum @ Rs 7211.15 / cum						Rs 9086.05	
3	5.9.12 Centering and shuttering including strutting, etc. and removal of form for:Well steining							
	Bottom	2*1	0.500	1.050			1.050	
	Sides	2*2	0.500		1.050		2.100	
	Total Quantity						3.150 sqm	

Total Deducted Quantity							0.000 sqm		
Net Total Quantity							3.150 sqm		
Say 3.150 sqm @ Rs 249.69 / sqm							Rs 786.52		
4	od236603/2022_2023 Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 5 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years								
		3					3.000		
	Total Quantity							3.000 each set	
	Total Deducted Quantity							0.000 each set	
	Net Total Quantity							3.000 each set	
	Say 3.000 each set @ Rs 105319.01 / each set							Rs 315957.03	
SI No	Description	No	L	B	D	CF	Quantity	Remark	
7 Construction of Column & Erection of ISMB									
1	5.33.2 Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.All work above plinth level upto floor V level								
	upto 1.5 m from G.L above G.L for column	2	0.200	0.300	0.500		0.060		
	1.5m to 4.5m above G.L above 1.5m from G.L for column	2	0.200	0.300	2.500		0.300		
	Total Quantity							0.360 cum	
	Total Deducted Quantity							0.000 cum	
	Net Total Quantity							0.360 cum	
	Say 0.360 cum @ Rs 11065.64 / cum							Rs 3983.63	
2	5.34.1								

	Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).							
	upto 1.5 m from G.L above G.L for column	2	0.200	0.300	0.500		0.060	
	1.5m to 4.5m above G.L above 1.5m from G.L for column	2	0.200	0.300	2.500		0.300	
	Total Quantity						0.360 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.360 cum	
	Say 0.360 cum @ Rs 82.10 / cum						Rs 29.56	
3	od242992/2022_2023 Extra for providing sulphate resistant cement for the structures above plinth level.							
	upto 1.5 m from G.L above G.L for column	2	0.200	0.300	0.500		0.060	
	1.5m to 4.5m above G.L above 1.5m from G.L for column	2	0.200	0.300	2.500		0.300	
	Total Quantity						0.360 cum	
	Total Deducted Quantity						0.000 cum	
	Net Total Quantity						0.360 cum	
	Say 0.360 cum @ Rs 1916.05 / cum						Rs 689.78	
4	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Piers, Abutments, Posts and Struts							
	upto 3.0m from G.L for column	4	0.300		2.000		2.400	
		4	0.200		2.000		1.600	
	above 3.0 m to 4.0 m	4	0.300		1.000		1.200	
		4	0.200		1.000		0.800	
	Total Quantity						6.000 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						6.000 sqm	
	Say 6.000 sqm @ Rs 863.64 / sqm						Rs 5181.84	
5	5.22.6 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and							

	binding all complete upto plinth levelThermo - Mechanically Treated bars of grade Fe-500D or more							
		1	0.360	100.000			36.000	
	Total Quantity						36.000 kilogram	
	Total Deducted Quantity						0.000 kilogram	
	Net Total Quantity						36.000 kilogram	
	Say 36.000 kilogram @ Rs 98.30 / kilogram						Rs 3538.80	
6	13.52.1 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.On steel work							
		36	0.0508				1.829	
		1	3.900		0.250		0.975	
		2	3.900	0.130			1.014	
		1	7.200		0.600		4.320	
		2	7.200	0.210			3.024	
	Total Quantity						11.162 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						11.162 sqm	
	Say 11.162 sqm @ Rs 223.32 / sqm						Rs 2492.70	
7	13.7.1 12 mm cement plaster finished with a floating coat of neat cement of mix:1:3 (1 cement : 3 fine sand)							
	Side	8	0.300		3.000		7.200	
		2	0.300	0.300			0.180	
	Total Quantity						7.380 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						7.380 sqm	
	Say 7.380 sqm @ Rs 401.21 / sqm						Rs 2960.93	
8	13.39.2 Colour washing such as green, blue or buff to give an even shade:New work (two or more coats) with a base coat of whiting							
	Side	8	0.300		3.000		7.200	
		2	0.300	0.300			0.180	
	Total Quantity						7.380 sqm	
	Total Deducted Quantity						0.000 sqm	
	Net Total Quantity						7.380 sqm	

	Say 7.380 sqm @ Rs 45.29 / sqm						Rs 334.24	
9	10.2 Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.							
	Supply and fixing ISMB 300mm of 42.2kg/m for 3.9m on column over screen/grit well	1	42.200	3.900			164.580	
	Total Quantity						164.580 kg	
	Total Deducted Quantity						0.000 kg	
	Net Total Quantity						164.580 kg	
	Say 164.580 kg @ Rs 119.79 / kg						Rs 19715.04	
10	od247075/2022_2023 Charges for chain pulley block with travelling trolley of 1 Tonne capacity							
		1					1.000	
	Total Quantity						1.000 each	
	Total Deducted Quantity						0.000 each	
	Net Total Quantity						1.000 each	
	Say 1.000 each @ Rs 12760.00 / each						Rs 12760.00	
SI No	Description	No	L	B	D	CF	Quantity	Remark
8 Providing Odour control mechanism for well at STP site including supplying,installation commissioning electrical and civil works factory test etc complete all as per directions of Engineer in charge								
Lump-Sum Total						Rs 675000.00		
	Provision for GST payments (in %) @						0.0%	
Amount reserved for GST payments						0.00		
Total						4399243.00		
Lumpsum for round off						0.00		
TOTAL Rs 4399243.00								
Rounded Total Rs 43,99,243								
Rupees Forty Three Lakh Ninety Nine Thousand Two Hundred and Forty Three Only								

(Cost Index Applied for this estimate is 35.59%)

Data Analysis

Colletion well 3m dia					
1 Specification Code: 2.6.1					

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89
TOTAL					1578.52
Cost of 10.0 cum					1578.52
Cost per cum					157.85
Say					157.85

	Cost index	35.59 %			56.18
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	Total with Cost index				214.03
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2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
TOTAL					675.50
Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

	Cost index 35.59 %				27.92
	Total with Cost index				106.37

3 Specification Code: od236202/2022_2023

od236202/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 1.5m to 3m (R1)

Quantity for 3.0m depth= $3.14 \times 2.1 \times 2.1 \times 3 = 41.5422 \text{ m}^3$

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%= $175.78 \times 1.01 \times 1.15 \times 1.3559 = 276.83$

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 414.2 *1.3559 =561.61	cum	41.54220	561.61	23330.51
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	41.54220	276.83	11500.13
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					35430.64
	cost for 3.0 metre				35430.64
	cost for one metre				11810.21
	say				11810.21

	Add Water Charges @ 1.0%				118.10
	Add CPOH @ 15.0%				1789.24
	Cost index 35.59 %				82.67
	Total with Cost index				13800.23
	Say				13800.23

4 Specification Code: od236226/2022_2023

od236226/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 3m to 4.5m (R1)

Quantity for 3.0m depth=3.14*2.1*2.1*3=41.5422m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.3 451.85 *1.3559 =612.66	cum	41.54220	612.66	25451.24
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	41.54220	276.83	11500.13
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					37551.37
	cost for 3.0 metre				37551.37
	cost for one metre				12517.12
	say				12517.12

	Add Water Charges @ 1.0%				125.17
	Add CPOH @ 15.0%				1896.34
	Cost index 35.59 %				82.67
	Total with Cost index				14621.31
	Say				14621.31

5 Specification Code: od236235/2022_2023

od236235/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 4.5m to 6.0m (R1)

Quantity for 3.0m depth=3.14*2.1*2.1*3=41.5422m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.4 489.5 *1.3559 =663.71	cum	41.54220	663.71	27571.97
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	41.54220	276.83	11500.13
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					39672.10
	cost for 3.0 metre				39672.10
	cost for one metre				13224.03
	say				13224.03

	Add Water Charges @ 1.0%				132.24
	Add CPOH @ 15.0%				2003.44
	Cost index 35.59 %				82.67
	Total with Cost index				15442.39
	Say				15442.39

6 Specification Code: od236257/2022_2023

od236257/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 6m to 7.5m (R1)

Quantity for 3.0m depth= $3.14 \times 2.1 \times 2.1 \times 3 = 41.5422 \text{m}^3$

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%= $175.78 \times 1.01 \times 1.15 \times 1.3559 = 276.83$

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) $545.99 \times 1.3559 = 740.307$	cum	41.54220	740.31	30753.98
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	41.54220	276.83	11500.13
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					42854.11
	cost for 3.0 metre				42854.11
	cost for one metre				14284.70
	say				14284.70

	Add Water Charges @ 1.0%				142.84
	Add CPOH @ 15.0%				2164.13
	Cost index 35.59 %				82.67
	Total with Cost index				16674.35
	Say				16674.35

7 Specification Code: od236259/2022_2023

od236259/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using

necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. For 3m dia and depth 7.5m to 9m(R1)

Quantity for 3.0m depth=3.14*2.1*2.1*3=41.5422m³

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%=175.78*1.01*1.15*1.3559=276.83

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.6 564.85 *1.3559 =765.88	cum	41.54220	765.88	31816.34
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	41.54220	276.83	11500.13
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					43916.47
	cost for 3.0 metre				43916.47
	cost for one metre				14638.82
	say				14638.82

	Add Water Charges @ 1.0%				146.38
	Add CPOH @ 15.0%				2217.78
	Cost index 35.59 %				82.67
	Total with Cost index				17085.67
	Say				17085.67

8 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	<p>Details of cost for 26.39 sqm</p> <p>Surface area</p> <p>Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm</p> <p>MATERIAL:</p> <p>Assuming that the timber will become unserviceable after being used 8 times</p> <p>planks 38 mm (Second class kail wood</p> <p>$26.39 \times 0.038 = 1.00$ cum</p> <p>Wastage 2% = 0.20 cum.</p> <p>Total = 1.20 cum . or 1200 cudm.</p> <p>Qty for cost using once = $1200/8 = 150$ cudm</p>				
1198	<p>Second class kail wood in planks</p> <p>2nd class kail wood battens</p> <p>Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712$ cum</p> <p>Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798$ cum</p> <p>Total = 0.1510 cum.</p> <p>Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm</p> <p>Qty for cost using once = $0.1586/8 = 0.0198$ cum</p>	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = $53/8 = 6.625$ m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material $(P+Q+R)/6 = (3750.00+0.50+245.12/6)$	metre	6.625	40.00	265.00(R)
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Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations

Cost index	35.59 %		65.54
Total with Cost index			249.69

9 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1

All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00
TOTAL					5977.32

Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

Cost index 35.59 %	2470.89
Total with Cost index	9413.54

10 Specification Code: 5.33.2

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2

All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20

0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level $0.75 \times 2.5 = 1.88$	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL				7026.36
Add Water Charges @ 1%				70.26
TOTAL				7096.62
Add CPOH @ 15%				1064.49
TOTAL				8161.11
Cost of 1.0 cum				8161.11
Say				8161.1

	Cost index 35.59 %				2904.54
	Total with Cost index				11065.64

11 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

12 Specification Code: od235904/2022_2023

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od235904/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

13 Specification Code: 4.1.2

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.2 1:1/2:3 (cement : 1 1/2 coarse sand : 3 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
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	Details of cost for 1 cum MATERIL:				
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.4	4940.00	1976.00
2209	Carriage of Cement	tonne	0.4	92.24	36.90
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

	TOTAL	5389.29
	Add Water Charges @ 1%	53.89
	TOTAL	5443.18
	Add CPOH @ 15%	816.48
	TOTAL	6259.66
	Cost of 1.0 cum	6259.66
	Say	6259.65

	Cost index 35.59 %				2227.81
	Total with Cost index				8487.46

14 Specification Code: 10.1

SUBHEAD : 10.0

STEEL WORK

10.1

Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				
	Other Engineering Organisations				
1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34
AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)					63.17
TOTAL					6512.45

AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)	957.07
TOTAL	7470.00
Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

Cost index	35.59 %				26.59
Total with Cost index					101.29

15 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31

2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL				4578.85
Add Water Charges @ 1%				45.79
TOTAL				4624.64
Add CPOH @ 15%				693.70
TOTAL				5318.34
Cost of 1.0 cum				5318.34
Say				5318.35

Cost index 35.59 %					1892.80
Total with Cost index					7211.15

16 Specification Code: 5.22.6

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6

Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82
TOTAL					6241.51
Add Water Charges @ 1%					62.42
TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52
Cost per kilogram					72.50
Say					72.5

	Cost index 35.59 %				25.80
	Total with Cost index				98.30

17 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and

applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25
Cost of 10.0 sqm					1647.25

Cost per sqm	164.72
Say	164.7

Cost index 35.59 %	58.62
Total with Cost index	223.32

18 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95
Cost per cum					190.69
Say					190.7

Cost index 35.59 %	67.87
Total with Cost index	258.57

19 Specification Code: od235906/2022_2023

**od235906/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km
KEIL/Bhrahmapuram as directed by the Engineer**

First 5km Rs129.71 Addition for 20 km $15.20 \times 5 \text{ km} + 12.63 \times 10 + 5 \times 10.44 = 254.5$ Refer Section 1 Carriage of materials
1.1.2 Rate including Wchae=rge,CPOH and Cost Index= $254.5 \times 1.01 \times 1.15 \times 1.3559 = 400.81$

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
TOTAL					490.52
cost for one cum					490.52
	say				490.52

	Add Water Charges @ 1.0%				4.90
	Add CPOH @ 15.0%				74.31
	Cost index 35.59 %				37.08
	Total with Cost index				606.82
	Say				606.82

20 Specification Code: 19.16

SUBHEAD : 19.0

DRAINAGE

19.16

Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical

resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. floor rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number 4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) 1st class	Day	0.02	738.00	14.76
0124	Mason (brick layer) 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
Add Water Charges @ 1% except on A ie on (354.8-62.7=292.1)					2.92
TOTAL					357.72
Add CPOH @ 15% except on A ie on (357.72-62.7=295.02)					44.25
TOTAL					401.95
Cost of 1.0 each					401.95
Cost of 1 each					401.95
Say					401.95

	Cost index 35.59 %				143.05
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	Total with Cost index				545.00
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21 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whitening

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46
TOTAL					287.76
Add Water Charges @ 1%					2.88
TOTAL					290.64
Add CPOH @ 15%					43.60
TOTAL					334.24
Cost of 10.0 sqm					334.24
Cost per sqm					33.42
Say					33.4

	Cost index 35.59 %				11.89
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	Total with Cost index				45.29
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Grit/Screen Chamber 3m dia
1 Specification Code: 2.6.1

2.6 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89
TOTAL					1578.52
Cost of 10.0 cum					1578.52
Cost per cum					157.85
Say					157.85

	Cost index 35.59 %				56.18
	Total with Cost index				214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
TOTAL					675.50
Other Engineering Organisation Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

	Cost index 35.59 %				27.92
	Total with Cost index				106.37

3 Specification Code: od235894/2022_2023

od235894/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 1.5m to 3.0m

Quantity for 3.0m depth= $3.14 \times 1.95 \times 1.95 \times 3 = 35.82 \text{m}^3$

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%= $175.78 \times 1.01 \times 1.15 \times 1.3559 = 276.83$

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 $356.61 \times 1.3559 = 483.52$	cum	35.82000	483.52	17319.69
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					27835.74
	cost for 3.0 metre				27835.74
	cost for one metre				9278.58
	say				9278.58

	Add Water Charges @ 1.0%				92.78
	Add CPOH @ 15.0%				1405.70
	Cost index 35.59 %				82.67
	Total with Cost index				10859.75
	Say				10859.75

4 Specification Code: od235897/2022_2023

od235897/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 3.0m to 4.5m

Quantity for 3.0m depth= $3.14 \times 1.95 \times 1.95 \times 3 = 35.82 \text{m}^3$

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%= $175.78 \times 1.01 \times 1.15 \times 1.3559 = 276.83$

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.2 $389.02.19 \times 1.3559 = 527.48$	cum	35.82000	527.48	18894.33
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					29410.38
	cost for 3.0 metre				29410.38
	cost for one metre				9803.46
	say				9803.46

	Add Water Charges @ 1.0%				98.03
	Add CPOH @ 15.0%				1485.22
	Cost index 35.59 %				82.67
	Total with Cost index				11469.39
	Say				11469.39

5 Specification Code: od235901/2022_2023

od235901/2022_2023 :Sinking wells above 2.5 m dia. and up to 3.5m inside below spring level in all classes of soil to lines and levels and plumb by scooping out earth from inside and below the steining using necessary appliances including hire and labour for the same including dumping the spoil beyond the initial lead of 50 m etc. complete. Total depth 4.5m to 6.0m

Quantity for 3.0m depth= $3.14 \times 1.95 \times 1.95 \times 3 = 35.82 \text{m}^3$

Rate for lead including ater Charge 1% , CPOH 15% and Cost Index 35.59%= $175.78 \times 1.01 \times 1.15 \times 1.3559 = 276.83$

Code	Description	Unit	Quantity	Rate	Amount
MR	Earth work excavation in all classes of soil soil below spring level (vide corresponding item in open well excavation DATA derived as per PHED SDB- rate excluding water charge and CPH) 100.3.3.4 $421.44 \times 1.3559 =$	cum	35.82000	571.43	20468.62
MR	Extra for additional lead of 50m or part thereof over initial lead (vide item 1.2.2 - carriage - of DSR 2018)including Water charge, CPOH and Cost index	cum	35.82000	276.83	9916.05
9999	Sundries	L.S	300.00000	2.00	600.00
TOTAL					30984.67
	cost for 3.0 metre				30984.67
	cost for one metre				10328.22
	say				10328.22

	Add Water Charges @ 1.0%				103.28
	Add CPOH @ 15.0%				1564.72
	Cost index 35.59 %				82.67
	Total with Cost index				12078.90
	Say				12078.90

6 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE**5.9** Centering and shuttering including strutting, etc. and removal of form for:**5.9.12** Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood $26.39 \times 0.038 = 1.00$ cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = $1200/8 = 150$ cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712$ cum Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798$ cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = $0.1586/8 = 0.0198$ cum	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = $53/8 = 6.625$ m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material $(P+Q+R)/6 = (3750.00+0.50+245.12/6)$	metre	6.625	40.00	265.00(R)
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Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations

Cost index	35.59 %		65.54
Total with Cost index			249.69

7 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1

All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating &curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00
TOTAL					5977.32

Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

Cost index 35.59 %	2470.89
Total with Cost index	9413.54

8 Specification Code: 5.33.2

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2

All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20

0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level $0.75 \times 2.5 = 1.88$	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL	7026.36
Add Water Charges @ 1%	70.26
TOTAL	7096.62
Add CPOH @ 15%	1064.49
TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

	Cost index 35.59 %				2904.54
	Total with Cost index				11065.64

9 Specification Code: 5.34.1

5.34 Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1 Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

10 Specification Code: od235904/2022_2023

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od235904/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

11 Specification Code: 4.1.2

4.1 Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.2 1:1/2:3 (cement : 1 1/2 coarse sand : 3 graded stone aggregate 20 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
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	Details of cost for 1 cum MATERIL:				
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.4	4940.00	1976.00
2209	Carriage of Cement	tonne	0.4	92.24	36.90
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	14.3	2.00	28.60

	TOTAL	5389.29
	Add Water Charges @ 1%	53.89
	TOTAL	5443.18
	Add CPOH @ 15%	816.48
	TOTAL	6259.66
	Cost of 1.0 cum	6259.66
	Say	6259.65

	Cost index 35.59 %				2227.81
	Total with Cost index				8487.46

12 Specification Code: 10.1

SUBHEAD : 10.0

STEEL WORK

10.1 Structural steel work in single section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one quintal MATERIAL: Steel: 1.00q Add wastage @ 5% = 0.05q Total+ 1.05q				
	Other Engineering Organisations				
1007	Structural steel such as tees, angles, channels and R.S. joists	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel LABOUR:	tonne	0.105	92.24	9.69
0116	Fitter(grade1)	Day	0.5	738.00	369.00
0103	Blacksmith 2nd class	Day	0.75	679.00	509.25
0114	Beldar Prime coat	Day	1.0	558.00	558.00
13.50.3	Rate as per item Number13.50.3 of SH: Finishing	sqm	3.0	44.00	132.00(A)
9999	Sundries -	L.S	20.67	2.00	41.34
AddWater Charges @ 1% except on A ie on (6449.28-132.0=6317.28)					63.17
TOTAL					6512.45

AddCPOH @ 15% except on A ie on (6512.45-132.0=6380.45)	957.07
TOTAL	7470.00
Cost of 100.0 kilogram	7470.00
Cost of 1 kilogram	74.70
Say	74.7

Cost index	35.59 %				26.59
Total with Cost index					101.29

13 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Other Engineering Organisations

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31

2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL				4578.85
Add Water Charges @ 1%				45.79
TOTAL				4624.64
Add CPOH @ 15%				693.70
TOTAL				5318.34
Cost of 1.0 cum				5318.34
Say				5318.35

Cost index 35.59 %					1892.80
Total with Cost index					7211.15

14 Specification Code: 5.22.5

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.5

Hard drawn steel wire fabric

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Hard drawn steel wire fabric 100kg/7.75 kg = 12.903 sqm Wastage 5% = 0.64 sqm Total = 13.548 sqm				
1021	Hard drawn steel wire fabric	sqm	13.548	430.00	5825.64
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For cutting and laying in position	L.S	26.0	2.00	52.00
0103	Blacksmith 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	1.5	558.00	837.00
9999	Sundries-and binding wire	L.S	13.52	2.00	27.04
TOTAL					6887.17
Add Water Charges @ 1%					68.87
TOTAL					6956.04
Add CPOH @ 15%					1043.41
TOTAL					7999.45
Cost of 100.0 kilogram					7999.45
Cost per kilogram					79.99
Say					80.0

	Cost index 35.59 %				28.47
	Total with Cost index				108.47

15 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25

Cost of 10.0 sqm	1647.25
Cost per sqm	164.72
Say	164.7

Cost index 35.59 %	58.62
Total with Cost index	223.32

16 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40
TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95
Cost per cum					190.69
Say					190.7

Cost index 35.59 %	67.87
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	Total with Cost index				258.57
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17 Specification Code: od235906/2022_2023

**od235906/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km
KEIL/Bhrahmapuram as directed by the Engineer**

First 5km Rs129.71 Addition for 20 km $15.20 \times 5 \text{ km} + 12.63 \times 10 + 5 \times 10.44 = 254.5$ Refer Section 1 Carriage of materials
1.1.2 Rate including Wchae=rge,CPOH and Cost Index= $254.5 \times 1.01 \times 1.15 \times 1.3559 = 400.81$

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
TOTAL					490.52
cost for one cum					490.52
	say				490.52

	Add Water Charges @ 1.0%				4.90
	Add CPOH @ 15.0%				74.31
	Cost index 35.59 %				37.08
	Total with Cost index				606.82
	Say				606.82

18 Specification Code: 19.16

SUBHEAD : 19.0

DRAINAGE

19.16

Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides

necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. floor rest 30x20x15 cm	each	1.0	110.00	110.00
9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number 4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) 1st class	Day	0.02	738.00	14.76
0124	Mason (brick layer)2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90
Add Water Charges @ 1% except on A ie on (354.8-62.7=292.1)					2.92
TOTAL					357.72
Add CPOH @ 15% except on A ie on (357.72-62.7=295.02)					44.25
TOTAL					401.95
Cost of 1.0 each					401.95
Cost of 1 each					401.95
Say					401.95

	Cost index 35.59 %				143.05
	Total with Cost index				545.00

19 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whitening

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46
TOTAL					287.76
Add Water Charges @ 1%					2.88
TOTAL					290.64
Add CPOH @ 15%					43.60
TOTAL					334.24
Cost of 10.0 sqm					334.24
Cost per sqm					33.42
Say					33.4

	Cost index 35.59 %				11.89
	Total with Cost index				45.29

20 Specification Code: 10.2

SUBHEAD : 10.0

STEEL WORK

10.2

Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				
1007	Structural steel such as tees, angles, channels and R.S. joists (ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+ Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+ Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg. Total = 50.65 kg+ Add wastage @ 5% = 2.53kg Total = 53.18kg. = 0.53 qtl	quintal	1.6	4600.00	7360.00

1009	<p>Flats exceeding 10 mm in thickness</p> <p>(iii) Gusset plates 10 mm thick: $1 \times 0.74 \times 0.35 \text{m} = 0.259 \text{ sqm.} +$ Shone $4 \times 0.46 \times 0.46 = 0.845 \text{ sqm.}$ Total = 1.104 sqm. $1.104 \text{ sqm} @ 78.4 \text{ kg/m} = 86.55 \text{ kg}$ 12 mm plates at the point of principal rafter and strut: $2 \times 0.3 \times 0.2 = 0.12 \text{ sqm.} +$ Tie beam, brace and strut: $2 \times 0.5 \times 0.3 = 0.30 \text{ sqm.} +$ Sole plates: $2 \times 0.46 \times 0.46 = 0.42 \text{ sqm.} +$ Anchor plate: $2 \times 0.46 \times 0.1 = 0.09 \text{ sqm.}$ Total = 0.93 sqm. Say 1.00 sqm. $1.00 \text{ sqm.} @ 94.4 \text{ kg/m} = 94.40 \text{ kg.}$ Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00 kg or 1.90 q</p>	quintal	0.53	4600.00	2438.00
1010	<p>Mild steel plates</p> <p>(iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.</p>	quintal	1.9	4800.00	9120.00
1020	<p>Mild steel rivets</p> <p>(v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm</p>	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	<p>Carriage of Steel</p> <p>Carriage of steel $(0.160 + 0.053 + 0.091 + 0.099 + 0.007 + 0.005) =$ 0.415 tonne LABOUR:</p>	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40

0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron $9.5 \times 0.4 = 3.80$ sqm. + Struts $2.70 \times 0.16 = 0.43$ sqm. + Ties $5.4 \times 0.124 = 0.67$ sqm. + Braces $2 \times 1.84 \times 0.12 = 0.44$ sqm. + Ties $2.8 \times 0.12 = 0.34$ sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number 13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

Add Water Charges @ 1% except on A ie on (30081.43-249.92=29831.51)				298.32
TOTAL				30379.75
Add CPOH @ 15% except on A ie on (30379.75-249.92=30129.83)				4519.47
TOTAL				34898.25
Cost of 395.0 kg				34898.25
Cost of 1 kg				88.35
Say				88.35

	Cost index 35.59 %				31.44
	Total with Cost index				119.79

21 Specification Code: od247108/2022_2023

od247108/2022_2023 :Supply and erection of Cast Iron single faced manually operated rising type "&'Input Data-2'!G10&"mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and

frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangement and hand wheel fitted in well

Code	Description	Unit	Quantity	Rate	Amount
MR	Supply and erection of Cast Iron single faced manually operated rising type "G10&"mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangement and hand wheel fitted in well	each	1.00000	248251.00	248251.00
TOTAL					248251.00
	cost for 1.1615 set				248251.00
	cost for one set				213733.10
	say				213733.10

	Add Water Charges @ 1.0%				2137.33
	Add CPOH @ 15.0%				32380.56
	Cost index 35.59 %				0.00
	Total with Cost index				248251.00
	Say				248251.00

Silt Pit 1.5mx1.5mx1.2m

1 Specification Code: 2.6.1

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59
TOTAL					1372.63
Add CPOH @ 15%					205.89
TOTAL					1578.52
Cost of 10.0 cum					1578.52
Cost per cum					157.85
Say					157.85

	Cost index 35.59 %				56.18
	Total with Cost index				214.03

2 Specification Code: 2.27

2.27

Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
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	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95

	TOTAL	14597.33
	Add Water Charges @ 1%	145.97
	TOTAL	14743.30
	Add CPOH @ 15%	2211.49
	TOTAL	16954.79
	Cost of 10.0 cum	16954.79
	Cost per cum	1695.48
	Say	1695.5

	Cost index 35.59 %				603.43
	Total with Cost index				2298.93

3 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				

0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL	4578.85
Add Water Charges @ 1%	45.79
TOTAL	4624.64
Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34

	Say	5318.35
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	Cost index 35.59 %				1892.80
	Total with Cost index				7211.15

4 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1

All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50
0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44

7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR:	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

Other Engineering Organisations

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65
Cost of 1.0 cum	6942.65
Say	6942.65

Cost index	35.59 %				2470.89
Total with Cost index					9413.54

5 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over

the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

6 Specification Code: od235904/2022_2023

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od235904/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

Other Engineering Organisations

7 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69

9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in postion	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL					6241.51
Add Water Charges @ 1%					62.42
TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52
Cost per kilogram					72.50
Say					72.5

Cost index 35.59 %					25.80
Total with Cost index					98.30

8 Specification Code: 13.52.1

13.52 Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50

9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

Other Engineering Organisations				TOTAL	1418.21
Add Water Charges @ 1%					14.18
				TOTAL	1432.39
Add CPOH @ 15%					214.86
				TOTAL	1647.25
Cost of 10.0 sqm					1647.25
Cost per sqm					164.72
Say					164.7

	Cost index 35.59 %				58.62
	Total with Cost index				223.32

9 Specification Code: 5.9.12

SUBHEAD : 5.0**REINFORCED CEMENT CONCRETE****5.9** Centering and shuttering including strutting, etc. and removal of form for:**5.9.12** Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood $26.39 \times 0.038 = 1.00$ cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = $1200/8 = 150$ cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712$ cum Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798$ cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = $0.1586/8 = 0.0198$ cum	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = $53/8 = 6.625$ m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material $(P+Q+R)/6 = (3750.00+0.50+245.12/6)$	metre	6.625	40.00	265.00(R)
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Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations

Cost index	35.59 %	65.54
Total with Cost index		249.69

10 Specification Code: 13.7.1

13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand)				
3.3	Rate as per item Number 3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36

0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

TOTAL					2547.60
Add Water Charges @ 1%					25.48
TOTAL					2573.08
Add CPOH @ 15%					385.96
TOTAL					2959.04
Other Engineering Organisations Cost of 10.0 sqm					2959.04
Cost per sqm					295.90
Say					295.9

	Cost index 35.59 %				105.31
	Total with Cost index				401.21

11 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
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	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40

TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95
Cost per cum					190.69
Say					190.7

	Cost index 35.59 %			67.87
	Total with Cost index			258.57

12 Specification Code: od235906/2022_2023

**od235906/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km
KEIL/Bhrahmapuram as directed by the Engineer**

First 5km Rs129.71 Addition for 20 km $15.20 \times 5 \text{ km} + 12.63 \times 10 + 5 \times 10.44 = 254.5$ Refer Section 1 Carriage of materials
1.1.2 Rate including Wchae=rge,CPOH and Cost Index $= 254.5 \times 1.01 \times 1.15 \times 1.3559 = 400.81$

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
TOTAL					490.52

cost for one cum					490.52
	say				490.52

	Add Water Charges @ 1.0%				4.90
	Add CPOH @ 15.0%				74.31
	Cost index 35.59 %				37.08
	Total with Cost index				606.82
	Say				606.82

Valve chamber 1.5mx3.4mx1.52m

1 Specification Code: 2.6.1

2.6

Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed.

2.6.1

All kinds of soil

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum. Average output of Hydraulic Excavator per hour = 30cum MACHINERY:				
0020	Hydraulic Excavator (3D) with driver and fuel	Day	0.041	7000.00	287.00
0018	Hire and running charges of loader LABOUR:	Day	0.041	5000.00	205.00
0128	Mate Beldar/	Day	0.32	617.00	197.44
0115	Coolie	Day	1.2	558.00	669.60
TOTAL					1359.04
Add Water Charges @ 1%					13.59

TOTAL	1372.63
Add CPOH @ 15%	205.89
TOTAL	1578.52
Cost of 10.0 cum	1578.52
Cost per cum	157.85
Say	157.85

Cost index 35.59 %	56.18
Total with Cost index	214.03

2 Specification Code: 2.26.1

2.26 Extra for every additional lift 1.5 m or part there of in excavation / banking excavated or stacked materials.

2.26.1 All kinds of soil

Other Engineering Organisations

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum LABOUR:				
0128	Mate	Day	0.1	617.00	61.70
0114	Beldar	Day	1.1	558.00	613.80
TOTAL					675.50
Add Water Charges @ 1%					6.75
TOTAL					682.25
Add CPOH @ 15%					102.34
TOTAL					784.59
Cost of 10.0 cum					784.59
Cost per cum					78.46
Say					78.45

	Cost index 35.59 %				27.92
	Total with Cost index				106.37

3 Specification Code: 2.27

2.27

Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming consolidating and dressing complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 cum MATERIAL:				
6501	Sand zone V (jamina)	cum	10.0	1225.00	12250.00
2335	Carriage of Jamuna sand LABOUR:	cum	10.0	103.77	1037.70
0114	Beldar	Day	0.89	558.00	496.62
0115	Coolie	Day	1.07	558.00	597.06
0101	Bhisti	Day	0.35	617.00	215.95
TOTAL					14597.33
Add Water Charges @ 1%					145.97
TOTAL					14743.30
Add CPOH @ 15%					2211.49
TOTAL					16954.79
Cost of 10.0 cum					16954.79
Cost per cum					1695.48
Say					1695.5

	Cost index 35.59 %				603.43
	Total with Cost index				2298.93

4 Specification Code: 4.1.6

4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00
0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00

0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL					4578.85
Add Water Charges @ 1%					45.79
TOTAL					4624.64
Add CPOH @ 15%					693.70
TOTAL					5318.34
Cost of 1.0 cum					5318.34
Say					5318.35

Cost index 35.59 %					1892.80
Total with Cost index					7211.15

5 Specification Code: 5.33.1

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.1 All work upto plinth level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50

0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Other Engineering Organisations	cum	1.0	210.00	210.00
0155	Mason (average) Labour for pouring, consolidating & curing	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.0	2.00	26.00

TOTAL	5977.32
Add Water Charges @ 1%	59.77
TOTAL	6037.09
Add CPOH @ 15%	905.56
TOTAL	6942.65

Cost of 1.0 cum	6942.65
Say	6942.65

Cost index 35.59 %	2470.89
Total with Cost index	9413.54

6 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54
Cost of 1.0 cum					60.54
Say					60.55

	Cost index 35.59 %				21.55
	Total with Cost index				82.10

7 Specification Code: od235904/2022_2023

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od235904/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
	say				2247.40

	Add Water Charges @ 1.0%				22.47
	Add CPOH @ 15.0%				340.48
	Cost index 35.59 %				-694.31
	Total with Cost index				1916.05
	Say				1916.05

8 Specification Code: 5.22.6

5.22 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6 Thermo - Mechanically Treated bars of grade Fe-500D or more

Code	Description	Unit	Quantity	Rate	Amount
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	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in position	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL					6241.51
Add Water Charges @ 1%					62.42
Other Engineering Organisations TOTAL					6303.93
Add CPOH @ 15%					945.59
TOTAL					7249.52
Cost of 100.0 kilogram					7249.52
Cost per kilogram					72.50
Say					72.5

	Cost index 35.59 %				25.80
	Total with Cost index				98.30

9 Specification Code: 13.52.1

13.52

Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1 On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92
9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12
TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25
Cost of 10.0 sqm					1647.25
Cost per sqm					164.72
Say					164.7

	Cost index 35.59 %				58.62
	Total with Cost index				223.32

10 Specification Code: 5.9.12

SUBHEAD : 5.0

REINFORCED CEMENT CONCRETE

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.12 Well steining

Code	Description	Unit	Quantity	Rate	Amount
	<p>Details of cost for 26.39 sqm</p> <p>Surface area</p> <p>Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm</p> <p>MATERIAL:</p> <p>Assuming that the timber will become unserviceable after being used 8 times</p> <p>planks 38 mm (Second class kail wood</p> <p>$26.39 \times 0.038 = 1.00$ cum</p> <p>Wastage 2% = 0.20 cum.</p> <p>Total = 1.20 cum . or 1200 cudm.</p> <p>Qty for cost using once = $1200/8 = 150$ cudm</p>				

1198	Second class kail wood in planks 2nd class kail wood battens Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712 \text{ cum}$ Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798 \text{ cum}$ Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = $0.1586/8 = 0.0198 \text{ cum}$	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)
0302	Safeda ballies 125 mm diameter Inside $25 \times 1.00 = 25.00 \text{ m}$ Outside $28 \times 1.00 = 28.00 \text{ m}$ Total = 53.00 m Qty for cost using once = $53/8 = 6.625 \text{ m}$ Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material (P+Q+R)/6 = (3750.00+0.50+245.12/6)	metre	6.625	40.00	265.00(R)

Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Cost index	35.59 %				65.54
Total with Cost index					249.69

11 Specification Code: 5.9.16.1

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.16 Edges of slabs and breaks in floors and walls

5.9.16.1 Under 20 cm wide

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a 3mx3m slab 15cms thick 12m edge Length MATERIAL: Assuming that the timber will become unserviceable after being used 8 times				
1198	Second class kail wood in planks (i) Planks 30 mm thick (2nd class Kail wood or equivalent local soft wood) $4 \times 3 \times 0.15 \times 0.030 = 0.54 \text{ cum}$ Wastage @ 5% = 0.003 cum. Total = 0.057 cum = 57 cudm Qty taken for cost of using once = $57/8 = 7.125 \text{ cudm}$	10 cud m	7.125	260.00	185.25
1197	Second class kail wood in scantling (ii) Battens 75 mm x 100 mm (2nd class Kail wood) Horizontal $2 \times 4 \times 0.075 \times 0.1 \times 0.5 = 0.030$ Horizontal $2 \times 4 \times 0.075 \times 0.1 \times 1.5 = 0.090$ (iii) Vertical battens $16 \times 0.15 \times 0.075 \times 0.030 \text{ m} = 0.0054$ (iv) Struts $16 \times 0.25 \times 0.07 \times 0.075 = 0.0225$ Total = 0.1479 Wastage @ 5% = 0.0074 Total = 0.1553 cum = 155 cudm Qty taken for cost of using once = $155/8 = 19.375 \text{ cudm}$	10 cud m	19.375	260.00	503.75

2204	Carriage of Timber Planks = 0.057 cum. Batte4ns = 0.057 cum. Total = 0.212 cum. Qty taken for cost of using once = $0.212/8 = 0.0265$ cum LABOUR: For assembling erection dismantling & cleaning	cum	0.0265	118.59	3.14
0112	Carpenter 2nd class	Day	0.81	679.00	549.99
0114	Beldar	Day	0.54	558.00	301.32
9999	Sundries-	L.S	5.2	2.00	10.40

TOTAL					1553.85
Add Water Charges @ 1%					15.54
TOTAL					1569.39
Add CPOH @ 15%					235.41
Other Engineering Organisations TOTAL					1804.80
Cost of 12.0 metre					1804.80
Cost per metre					150.40
Say					150.4

	Cost index 35.59 %				53.53
	Total with Cost index				203.93

12 Specification Code: 2.25

2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.

Code	Description	Unit	Quantity	Rate	Amount
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	Details of cost for 10 cum. LABOUR:				
0128	Mate	Day	0.2	617.00	123.40
0115	Coolie	Day	2.5	558.00	1395.00
0101	Bhisti	Day	0.2	617.00	123.40

TOTAL					1641.80
Add Water Charges @ 1%					16.42
TOTAL					1658.22
Add CPOH @ 15%					248.73
TOTAL					1906.95
Cost of 10.0 cum					1906.95
Cost per cum					190.69
Say					190.7

	Cost index 35.59 %			67.87
	Total with Cost index			258.57

13 Specification Code: od235906/2022_2023

**od235906/2022_2023 :Conveying and disposing the excess earth and debris etc by lorry upto 25km
KEIL/Bhrahmapuram as directed by the Engineer**

First 5km Rs129.71 Addition for 20 km $15.20 \times 5 \text{ km} + 12.63 \times 10 + 5 \times 10.44 = 254.5$ Refer Section 1 Carriage of materials
1.1.2 Rate including Wchae=rge,CPOH and Cost Index= $254.5 \times 1.01 \times 1.15 \times 1.3559 = 400.81$

Code	Description	Unit	Quantity	Rate	Amount
2241	Good earth	cum	1.00000	129.71	129.71
MR	Addition for 20 km per m3	cum	1.00000	400.81	400.81
0979	Royalty for good earth	cum	-1.00000	40.00	-40.00
TOTAL					490.52

cost for one cum					490.52
	say				490.52

	Add Water Charges @ 1.0%				4.90
	Add CPOH @ 15.0%				74.31
	Cost index 35.59 %				37.08
	Total with Cost index				606.82
	Say				606.82

14 Specification Code: 19.16

SUBHEAD : 19.0

DRAINAGE

19.16

Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia steel bar conforming to IS:1786, having minimum cross section as 23 mm x 25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufactures permanent identification mark to be visible even after fixing including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)Complete as per design

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for one no. Details:				
7354	Plastic encapsulated M.S. foot rest 30x20x15 cm	each	1.0	110.00	110.00

9988	Carriage and sundries Cement concrete 1:3:6 (0.30x0.20x15)=0.009 cum)	L.S	1.82	2.00	3.64
4.2.5	Rate as per item Number 4.2.5 of SH: Concrete work LABOUR:	cum	0.009	6966.75	62.70(A)
0123	Mason (brick layer) 1st class	Day	0.02	738.00	14.76
0124	Mason (brick layer) 2nd class	Day	0.2	679.00	135.80
0114	Beldar	Day	0.05	558.00	27.90

Add Water Charges @ 1% except on A ie on (354.8-62.7=292.1)					2.92
TOTAL					357.72
Add CPOH @ 15% except on A ie on (357.72-62.7=295.02)					44.25
TOTAL					401.95
Cost of 1.0 each					401.95
Cost of 1 each					401.95
Say					401.95

Cost index 35.59 %					143.05
Total with Cost index					545.00

SILT RAISER ARRANGEMENTS					
1 Specification Code: 18.71.1					

SUBHEAD : 18.0**WATER SUPPLY****18.71**

Providing and laying Double Flanged (screwed / welded) Centrifugally (Spun)
Cast Iron, Class B (IS : 1536):

18.71.1

100 mm dia C.I Double Flanged Pipe

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 5 metre MATERIAL: 100 mm dia. cast iron pipes double flanged weight of 1m pipe = 27.00 kg Weight of 5 m pipes 27.00 x 5 = 135.00 kg				
7712	Screwed double flanged centrifugally cast (spun) C.I Pipe pf Class B conforming to I.S. 1536.- 100 mm dia	metre	5.0	1310.00	6550.00
2319	Carriage of Spun iron S & S pipes 100 mm dia Labour for laying	100 meter	5.0	226.82	11.34
18.23	Rate as per item Number 18.23 of SH: Water Supply	quintal	1.35	229.40	309.69(A)
Add Water Charges @ 1% except on A ie on (6871.03-309.69=6561.34)					65.61
Other Engineering Organisations TOTAL					6936.64
Add CPOH @ 15% except on A ie on (6936.64-309.69=6626.95)					994.04
TOTAL					7930.75
Cost of 5.0 metre					7930.75
Cost of 1 metre					1586.15
Say					1586.15

	Cost index 35.59 %				564.51
	Total with Cost index				2150.66

2 Specification Code: od235893/2022_2023

od235893/2022_2023 :Supplying, conveying and fixing the following CI specials as per IS 1538 etc.
complete.- 100 mm D/F 90oDuck Foot Bend

Code	Description	Unit	Quantity	Rate	Amount
MR	Suppllyng and laying of 100 mm D/F 90oDuck Foot Bend TWAD rate	no	1.00000	2607.00	2607.00
TOTAL					2607.00
cost for one each					2607.00
	say				2607.00

	Add Water Charges @ 1.0%				26.07
	Add CPOH @ 15.0%				394.96
	Cost index 35.59 %				0.00
	Total with Cost index				3028.03
	Say				3028.03

3 Specification Code: od235896/2022_2023

od235896/2022_2023 :Supplying, conveying and fixing the following CI specials as per IS 1538 etc.
complete.- 100 mm dia D/F CI bend 90o bend

Code	Description	Unit	Quantity	Rate	Amount
MR	Suppllyng and laying of 100 mm dia D/F CI bend 90o bend TWAD rate	no	1.00000	1824.00	1824.00
TOTAL					1824.00
cost for one each					1824.00
	say				1824.00

	Add Water Charges @ 1.0%				18.23
	Add CPOH @ 15.0%				276.33
	Cost index 35.59 %				0.00

	Total with Cost index				2118.58
	Say				2118.58

4 Specification Code: od235899/2022_2023

od235899/2022_2023 :Supplying and layinh 100mm dia CI D/F pipe -2m length including earthwork excavation in all kinds of soil including refilling the excavated earth etc complete

Code	Description	Unit	Quantity	Rate	Amount
18.71.1	Rate as per item number 18.71.1 of SH: Water Supply	metre	2.00000	1365.60	2731.21
2.8.1	Rate as per item number 2.8.1 of SH: Earth Work	cum	1.00000	188.55	188.55
9999	Sundries	L.S	10.00000	2.00	20.00
TOTAL					2939.76
cost for one each					2939.76
	say				2939.76

	Add Water Charges @ 1.0%				29.39
	Add CPOH @ 15.0%				445.37
	Cost index 35.59 %				1215.23
	Total with Cost index				4629.76
	Say				4629.76

5 Specification Code: 18.30.2

18.30 Providing flanged joints to double flanged C.I./ D.I pipes and specials, including testing of joints:

18.30.2 100 mm diameter pipe

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 joints MATERIAL:				

1374	Rubber insertions for 100 mm dia pipe joints	each	10.0	18.00	180.00
1956	Bolts and nuts 16 mm dia 60 mm long	each	80.0	11.00	880.00
9977	Carriage of materialsLABOUR:	L.S	4.16	2.00	8.32
0116	Fitter(grade1)	Day	0.25	738.00	184.50
0117	Assistant Fitter or 2nd class fitter	Day	0.25	679.00	169.75
0114	Beldar	Day	1.0	558.00	558.00

TOTAL					1980.57
Add Water Charges @ 1%					19.81
TOTAL					2000.38
Add CPOH @ 15%					300.06
TOTAL					2300.44
Cost of 10.0 no					2300.44
Cost of each					230.04
Other Engineering Organisations Say					230.05

Cost index 35.59 %					81.87
Total with Cost index					311.92

6 Specification Code: od235903/2022_2023

od235903/2022_2023 :Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m.

Code	Description	Unit	Quantity	Rate	Amount
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MR	Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth, etc. complete at an average depth of 2.0m. TWAD	metre	1.00000	441.00	441.00
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TOTAL					441.00
cost for one metre					441.00
	say				441.00

	Add Water Charges @ 1.0%				4.41
	Add CPOH @ 15.0%				66.81
	Cost index 35.59 %				0.00
	Total with Cost index				512.22
	Say				512.22

Pumpsets, Pumping main, Interconnections and other connected works
1 Specification Code: od236577/2022_2023

od236577/2022_2023 :Supplying and laying 150mm Ductile pipes class K9 including cost of all materials , earthwork excavations and backfilling after completion of the work, jointing , testing , cost for pipes and specials etc complete all as per the direction of Engineer in charge Rate for 50m pipe laying works
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Code	Description	Unit	Quantity	Rate	Amount
18.72.16	Rate as per item number 18.72.16 of SH: Water Supply	metre	50.00000	1205.68	60284.12
2.10.1.3	Rate as per item number 2.10.1.3 of SH: Earth Work	metre	74.25000	493.60	36649.80
18.70.2	Rate as per item number 18.70.2 of SH: Water Supply	joint	11.00000	112.01	1232.11

18.83.4	Rate as per item number 18.83.4 of SH: Water Supply	Each Cut	3.00000	205.08	615.24
MR	Testing the pipeline after completion of work KWA rate	metre	50.00000	51.80	2590.00

TOTAL					101371.27
	cost for 50.0 metre				101371.27
	cost for one metre				2027.43
	say				2027.43

	Add Water Charges @ 1.0%				20.27
	Add CPOH @ 15.0%				307.15
	Cost index 35.59 %				816.68
	Total with Cost index				3171.54
	Say				3171.54

2	Specification Code: 4.1.6	Other Engineering Organisations
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4.1

Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level:

4.1.6

1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum MATERIAL:				
0293	Stone Aggregate(single size): 40 mm nominal size nominal size (0.70 cum - 7.5 % for voids i.e. 0.05 = 0.65 cum)	cum	0.65	1300.00	845.00

0295	Stone Aggregate(single size):20 mm nominal size nominal size	cum	0.24	1350.00	324.00
2206	Carriage of Stone aggregate 40 mm nominal size and above	cum	0.65	112.79	73.31
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.24	103.77	24.90
0982	Coarse sand (zone III)	cum	0.47	1350.00	634.50
2203	Carriage of Coarse sand	cum	0.47	103.77	48.77
0367	Portland Cement	tonne	0.22	4940.00	1086.80
2209	Carriage of Cement	tonne	0.22	92.24	20.29
0155	Mason (average)	Day	0.1	709.00	70.90
0114	Beldar	Day	1.63	558.00	909.54
0101	Bhisti	Day	0.7	617.00	431.90
0002	Hire charges of Concrete Mixer 0.25 to 0.40 cum with Hopper	Day	0.07	800.00	56.00
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-	L.S	13.52	2.00	27.04

TOTAL	4578.85
Add Water Charges @ 1%	45.79
TOTAL	4624.64
Add CPOH @ 15%	693.70
TOTAL	5318.34
Cost of 1.0 cum	5318.34
Say	5318.35

Cost index 35.59 %	1892.80
Total with Cost index	7211.15

3 Specification Code: 5.9.12

SUBHEAD : 5.0**REINFORCED CEMENT CONCRETE****5.9** Centering and shuttering including strutting, etc. and removal of form for:**5.9.12** Well steining

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 26.39 sqm Surface area Outside area = $22/7 \times 4.40 \times 1.00 = 13.82$ sqm = 26.39 sqm MATERIAL: Assuming that the timber will become unserviceable after being used 8 times planks 38 mm (Second class kail wood $26.39 \times 0.038 = 1.00$ cum Wastage 2% = 0.20 cum. Total = 1.20 cum . or 1200 cudm. Qty for cost using once = $1200/8 = 150$ cudm				
1198	Second class kail wood in planks 2nd class kail wood battens Inside = $2 \times 25 \times 0.50 \times 0.075 \times 0.038 = 0.0712$ cum Outside = $2 \times 28 \times 0.50 \times 0.075 \times 0.038 = 0.0798$ cum Total = 0.1510 cum. Wastage 5% = 0.0076 cum = 0.1586 cum . or 158.60 cudm Qty for cost using once = $0.1586/8 = 0.0198$ cum	10 cud m	150.0	260.00	3900.00(P)
1197	Second class kail wood in scantling	10 cud m	0.0198	260.00	0.51(Q)

0302	Safeda ballies 125 mm diameter Inside 25x1.00 = 25.00 m Outside 28x1.00 = 28.00 m Total = 53.00 m Qty for cost using once = $53/8 = 6.625$ m Add for carriage, labour for erection and dismantling etc. @ 1/6th of the cost of material $(P+Q+R)/6 = (3750.00+0.50+245.12/6)$	metre	6.625	40.00	265.00(R)
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Add Water Charges @ 1%	41.66
TOTAL	4207.17
Add CPOH @ 15%	631.07
TOTAL	4859.72
Cost of 26.39 sqm	4859.72
Cost of 1 sqm	184.15
Say	184.15

Other Engineering Organisations

Cost index	35.59 %		65.54
Total with Cost index			249.69

4 Specification Code: od236603/2022_2023

od236603/2022_2023 :Supply, erection, trial run and commissioning of Non clog Submersible pump with required support and auto locking for erecting inside the well and capable of required discharging capacity of 5 HP against a total head of 3 to 15m m and having speed less than 1000 rpm, Bronze/SS Impeller, SS shaft, Cast Iron casing, to be coupled with the suitable capacity of motor , starter with statutory protective relays in built a panel board for the protection of motor as per IE rules satisfying the requirements and including the cost of internal wiring with PVC insulated copper cable , valves, specials etc required delivery pipe and interconnected to pumping header. the cost includes all charges of pumpset, starter, valves, specials, interconnection, earthing including conveyance, loading and unloading, erection, trial running and commissioning including a warranty of 2 years

MR for Submercible pumpset -Av Rs. 18135 (based on KWA estimate approved rates)

Hence for 5HP pump= 5hp@Rs.18135=RS. 90675

Code	Description	Unit	Quantity	Rate	Amount
MR	5HP pumpset	each set	1.00000	90675.00	90675.00
TOTAL					90675.00
cost for one each set					90675.00
	say				90675.00

	Add Water Charges @ 1.0%				906.75
	Add CPOH @ 15.0%				13737.26
	Cost index 35.59 %				0.00
	Total with Cost index				105319.01
	Say				105319.01

Construction of Column & Erection of ISMB

1 Specification Code: 5.33.2 Other Engineering Organisations

5.33

Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer - in-charge. Note:- Cement content considered in this item is @ 330 kg/ cum. Excess or less cement used as per design mix is payable or recoverable separately.

5.33.2

All work above plinth level upto floor V level

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1.00 cum MATERIAL:				
0295	Stone Aggregate(single size):20 mm nominal size	cum	0.57	1350.00	769.50

0297	Stone Aggregate(single size): 10 mm nominal size	cum	0.28	1350.00	378.00
2202	Carriage of Stone aggregate below 40 mm nominal size	cum	0.85	103.77	88.20
0982	Coarse sand (zone III)	cum	0.425	1350.00	573.75
2203	Carriage of Coarse sand	cum	0.425	103.77	44.10
0367	Portland Cement	tonne	0.33	4940.00	1630.20
2209	Carriage of Cement	tonne	0.33	92.24	30.44
7318	Plasticizer / super plasticizer 0.50% of cement Production cost, pumping to respective floors and laying in position	kilogram	1.65	36.00	59.40
0004	Production cost of concrete by batch mix plant	cum	1.0	350.00	350.00
0009	Pumping charges of concrete including Hire charges of pump, piping work & accessories etc. LABOUR: Labour for pouring, consolidation & curing	cum	1.0	210.00	210.00
0155	Mason (average)	Day	0.17	709.00	120.53
0114	Beldar	Day	2.0	558.00	1116.00
0101	Bhisti	Day	0.9	617.00	555.30
0012	Vibrator (Needle type 40 mm)	Day	0.07	370.00	25.90
9999	Sundries-Extra labour for lifting up to floor five level $0.75 \times 2.5 = 1.88$	L.S	13.0	2.00	26.00
0115	Coolie	Day	1.88	558.00	1049.04

TOTAL				7026.36
Add Water Charges @ 1%				70.26
TOTAL				7096.62
Add CPOH @ 15%				1064.49

TOTAL	8161.11
Cost of 1.0 cum	8161.11
Say	8161.1

Cost index 35.59 %	2904.54
Total with Cost index	11065.64

2 Specification Code: 5.34.1

5.34

Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable/ recoverable separately.

5.34.1

Providing M-30 grade concrete instead of M-25 grade BMC/RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum).

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 cum. Cement for M-30 mix = 0.340 t Cement for M-25 mix = 0.330 t Difference = 0.010 t				
0367	Portland Cement	tonne	0.01	4940.00	49.40
2209	Carriage of Cement Plasticizer for M-30 mix = 1.70 kg Plasticizer for M-25 mix = 1.65 kg Difference = 0.05 kg	tonne	0.01	92.24	0.92
7318	Plasticizer / super plasticizer	kilogram	0.05	36.00	1.80
TOTAL					52.12
Add Water Charges @ 1%					.52
TOTAL					52.64
Add CPOH @ 15%					7.90
TOTAL					60.54

Cost of 1.0 cum	60.54
Say	60.55

Cost index 35.59 %	21.55
Total with Cost index	82.10

3 Specification Code: od242992/2022_2023

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od242992/2022_2023 :Extra for providing sulphate resistant cement for the structures above plinth level.

Code	Description	Unit	Quantity	Rate	Amount
MR	Sulphate resistant cement	tonne	0.34000	11550.00	3927.00
0367	Portland Cement	tonne	-0.34000	4940.00	-1679.60
TOTAL					2247.40
cost for one cum					2247.40
say					2247.40

Add Water Charges @ 1.0%	22.47
Add CPOH @ 15.0%	340.48
Cost index 35.59 %	-694.31
Total with Cost index	1916.05
Say	1916.05

4 Specification Code: 5.9.6

5.9 Centering and shuttering including strutting, etc. and removal of form for:

5.9.6 Columns, Pillars, Piers, Abutments, Posts and Struts

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 4.5 sqm. Size of column 450x450mm and 2.5 m high Area of contact = $4 \times 0.45 \times 2.5 = 4.5$ sqm MATERIAL: Assuming shuttering will become unserviceable after use of 40 times Add maintenance charges @ 10 % of cost of material Less salvage value of material after full use @ 25% of cost of material				
7331	Wall form panel 1250x450xmm Qty taken for cost of using once = $8 \times 0.85 / 40 = 0.17$	each	0.17	860.00	146.20
7332	Corner angle 45x45x5 mm 2.50 long Qty taken for cost of using once = $4 \times 0.85 / 40 = 0.085$	each	0.085	255.00	21.68
7333	Column clamp 450x1070 mm Qty taken for cost of using once = $5 \times 0.85 / 40 = 0.1063$	each	0.1063	965.00	102.58
7334	Prop 2 m (2-3.5m) Qty taken for cost of using once = $4 \times 0.85 / 40 = 0.085$	each	0.085	635.00	53.98
9999	Sundries-Qty taken for cost of using once = $1300 \times 0.85 / 40 = 27.62$	L.S	27.62	2.00	55.24
9977	Carriage LABOUR	L.S	52.0	2.00	104.00
0116	Fitter(grade1)	Day	1.0	738.00	738.00
0114	Beldar	Day	2.0	558.00	1116.00
9999	Sundries-Shuttering oil	L.S	39.0	2.00	78.00
9999	Sundries-Carriage	L.S	26.0	2.00	52.00
TOTAL					2467.68
Add Water Charges @ 1%					24.68

TOTAL	2492.36
Add CPOH @ 15%	373.85
TOTAL	2866.21
Cost of 4.5 sqm	2866.21
Cost per sqm	636.94
Say	636.95

Cost index 35.59 %	226.69
Total with Cost index	863.64

5 Specification Code: 5.22.6

5.22

Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position and binding all complete upto plinth level

5.22.6

Thermo - Mechanically Treated bars of grade Fe-500D or more

Other Engineering Organisations

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 1 quintal MATERIAL: Deformed twisted steel bars = 1.00 q Add 5% wastage = 0.05 Total = 1.05q				
1005	Twisted steel/deformed bars	quintal	1.05	4600.00	4830.00
2205	Carriage of Steel	tonne	0.105	92.24	9.69
9999	Sundries-Cover block LABOUR: For straightening, bending binding and placing in position	L.S	26.0	2.00	52.00
0102	Blacksmith 1st class	Day	1.0	738.00	738.00
0114	Beldar	Day	1.0	558.00	558.00
9999	Sundries-	L.S	26.91	2.00	53.82

TOTAL	6241.51
Add Water Charges @ 1%	62.42
TOTAL	6303.93
Add CPOH @ 15%	945.59
TOTAL	7249.52
Cost of 100.0 kilogram	7249.52
Cost per kilogram	72.50
Say	72.5

Cost index 35.59 %	25.80
Total with Cost index	98.30

6 Specification Code: 13.52.1

13.52

Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.

13.52.1

On steel work

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
4202	Red oxide Zinc chromate primer	Litre	0.75	110.00	82.50
9999	Sundries-Putty	L.S	2.73	2.00	5.46
9977	Carriage LABOUR:	L.S	0.39	2.00	0.78
0131	Painter	Day	0.25	679.00	169.75
0115	Coolie	Day	0.25	558.00	139.50
9999	Sundries-Brushes, sand paper etc.	L.S	5.46	2.00	10.92

9999	Sundries-EPOXY PAINTING MATERIAL:	L.S	10.66	2.00	21.32
7239	Epoxy paint	Litre	1.25	230.00	287.50
9977	Carriage of materialLABOUR:	L.S	1.43	2.00	2.86
0131	Painter	Day	0.54	679.00	366.66
0115	Coolie	Day	0.54	558.00	301.32
9999	Sundries-Putty, brushes, sand paper etc.	L.S	6.76	2.00	13.52
9999	Sundries-	L.S	8.06	2.00	16.12

TOTAL					1418.21
Add Water Charges @ 1%					14.18
TOTAL					1432.39
Add CPOH @ 15%					214.86
TOTAL					1647.25
Cost of 10.0 sqm					1647.25
Cost per sqm					164.72
Say					164.7

Cost index 35.59 %					58.62
Total with Cost index					223.32

7 Specification Code: 13.7.1					
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13.7 12 mm cement plaster finished with a floating coat of neat cement of mix:

13.7.1 1:3 (1 cement : 3 fine sand)

Code	Description	Unit	Quantity	Rate	Amount
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	Details of cost for 10 sqm MATERIAL: Cement mortar 1:3 (1 cement : 3 fine sand				
3.3	Rate as per item Number 3.3 of SH: Mortars MATERIAL:	cum	0.144	4183.05	602.36
0155	Mason (average)	Day	0.67	709.00	475.03
0115	Coolie	Day	0.75	558.00	418.50
0101	Bhisti	Day	0.92	617.00	567.64
9999	Sundries-Scaffolding and sundries.	L.S	12.61	2.00	25.22
0367	Portland Cement	tonne	0.02	4940.00	98.80
2209	Carriage of Cement	tonne	0.02	92.24	1.84
0155	Mason (average)	Day	0.27	709.00	191.43
0115	Coolie	Day	0.27	558.00	150.66
9999	Sundries-Scaffolding and sundries.	L.S	8.06	2.00	16.12

Other Engineering Organisations				TOTAL	2547.60
Add Water Charges @ 1%					25.48
				TOTAL	2573.08
Add CPOH @ 15%					385.96
				TOTAL	2959.04
Cost of 10.0 sqm					2959.04
Cost per sqm					295.90
Say					295.9

	Cost index 35.59 %				105.31
	Total with Cost index				401.21

8 Specification Code: 13.39.2

13.39 Colour washing such as green, blue or buff to give an even shade:

13.39.2 New work (two or more coats) with a base coat of whitening

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for 10 sqm MATERIAL:				
0775	Deharadun white lime	quintal	0.03	600.00	18.00
9977	Carriage of lime	L.S	8.06	2.00	16.12
9999	Sundries-Add for colouring stuff LABOUR:	L.S	0.91	2.00	1.82
0141	White Washer	Day	0.3	617.00	185.10
0115	Coolie	Day	0.1	558.00	55.80
9999	Sundries-Indigo gum etc.	L.S	2.73	2.00	5.46
9999	Sundries-ladders etc.	L.S	2.73	2.00	5.46
Other Engineering Organisations TOTAL					287.76
Add Water Charges @ 1%					2.88
TOTAL					290.64
Add CPOH @ 15%					43.60
TOTAL					334.24
Cost of 10.0 sqm					334.24
Cost per sqm					33.42
Say					33.4

	Cost index 35.59 %				11.89
	Total with Cost index				45.29

9 Specification Code: 10.2

SUBHEAD : 10.0**STEEL WORK****10.2**

Structural steel work riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

Code	Description	Unit	Quantity	Rate	Amount
	Details of cost for a truss 7.6 m clear span (weight = 3.95 quintal) MATERIAL: (i) Principal rafter (T-iron): 100x100x10 mm @ 15kg/m = 142.50kg+ Struts (angles) 40x40x6 mm: 2x1.35 = 2.70 m @ 3.5kg/m = 9.45 kg Total = 151.95 kg + Add wastage @ 5% = 7.60 kg Total = 159.55 kg. = 1.60 q				
1007	Structural steel such as tees, angles, channels and R.S. joists (ii) Tiles (flats) 50x12mm: 2x2.7 = 5.4 m @ 4.7 kg/m = 25.38kg+ Ties central (flats): 50x10mm 1x2.80 = 2.8 m @ 3.90 kg/m=10.92kg.+ Braces (flats)40x 10 mm: 2x1.84 = 3.68m @ 3.9 kg/m = 14.35 kg. Total = 50.65 kg+ Add wastage @ 5% = 2.53kg Total = 53.18kg. = 0.53 qtl	quintal	1.6	4600.00	7360.00

1009	<p>Flats exceeding 10 mm in thickness</p> <p>(iii) Gusset plates 10 mm thick: $1 \times 0.74 \times 0.35 \text{ m} = 0.259 \text{ sqm.} +$ Shone $4 \times 0.46 \times 0.46 = 0.845 \text{ sqm.}$ Total = 1.104 sqm. $1.104 \text{ sqm} @ 78.4 \text{ kg/m} = 86.55 \text{ kg}$ 12 mm plates at the point of principal rafter and strut: $2 \times 0.3 \times 0.2 = 0.12 \text{ sqm.} +$ Tie beam, brace and strut: $2 \times 0.5 \times 0.3 = 0.30 \text{ sqm.} +$ Sole plates: $2 \times 0.46 \times 0.46 = 0.42 \text{ sqm.} +$ Anchor plate: $2 \times 0.46 \times 0.1 = 0.09 \text{ sqm.}$ Total = 0.93 sqm. Say 1.00 sqm. $1.00 \text{ sqm.} @ 94.4 \text{ kg/m} = 94.40 \text{ kg.}$ Total = 180.95 kg Add wastage @ 5% = 9.05 kg. Total = 190.00 kg or 1.90 q</p>	quintal	0.53	4600.00	2438.00
1010	<p>Mild steel plates</p> <p>(iv) 16mm dia. 50 mm long rivets = 56 Nos.+ Add wastage @ 5 % = 2.8 Nos. Total = 58.8 Nos.</p>	quintal	1.9	4800.00	9120.00
1020	<p>Mild steel rivets</p> <p>(v) 20 mm dia. holding down bolts 4 Nos. x 460 mm = 1840mm + Add wastage @ 5% = 92 mm Total = 1932 mm</p>	quintal	0.0684	5000.00	342.00
1221	20 mm dia holding down bolts	quintal	0.0529	6100.00	322.69
2205	<p>Carriage of Steel</p> <p>Carriage of steel $(0.160 + 0.053 + 0.091 + 0.099 + 0.007 + 0.005) =$ 0.415 tonne LABOUR:</p>	tonne	0.415	92.24	38.28
0116	Fitter(grade1)	Day	2.7	738.00	1992.60
0103	Blacksmith 2nd class	Day	3.6	679.00	2444.40

0139	Skilled Beldar (for floor rubbing etc.)	Day	5.4	617.00	3331.80
0114	Beldar	Day	3.6	558.00	2008.80
0100	Bandhani Applying priming coat: T Iron $9.5 \times 0.4 = 3.80$ sqm. + Struts $2.70 \times 0.16 = 0.43$ sqm. + Ties $5.4 \times 0.124 = 0.67$ sqm. + Braces $2 \times 1.84 \times 0.12 = 0.44$ sqm. + Ties $2.8 \times 0.12 = 0.34$ sqm. Total = 5.68 sqm	Day	0.44	617.00	271.48
13.50.3	Rate as per item Number 13.50.3 of SH: Finishing	sqm	5.68	44.00	249.92(A)
9999	Sundries -	L.S	80.73	2.00	161.46

Add Water Charges @ 1% except on A ie on (30081.43-249.92=29831.51)				298.32
TOTAL				30379.75
Add CPOH @ 15% except on A ie on (30379.75-249.92=30129.83)				4519.47
TOTAL				34898.25
Cost of 395.0 kg				34898.25
Cost of 1 kg				88.35
Say				88.35

	Cost index 35.59 %				31.44
	Total with Cost index				119.79

10 Specification Code: od247075/2022_2023

od247075/2022_2023 :Charges for chain pulley block with travelling trolley of 1 Tonne capacity

Code	Description	Unit	Quantity	Rate	Amount
MR	Pulley Block - 1 Tonne	each	1.00000	10868.00	10868.00
MR	Extra length	metre	4.00000	473.00	1892.00
TOTAL					12760.00
	cost for 1.1615 each				12760.00
	cost for one each				10985.79
	say				10985.79

	Add Water Charges @ 1.0%				109.85
	Add CPOH @ 15.0%				1664.34
	Cost index 35.59 %				0.00
	Total with Cost index				12760.00
	Other Engineering Say Organisations				12760.00

PRICE

Annexure 2B

[Refer Para 4 of CUBE Ltr. No:
CUBE/ENVT/KMRL/120/2022-23 Dt.2022]

17.5 MLD - ELAMKULAM GENERAL ABSTRACT		
General Abstract – Construction, Commissioning and 10year O & M of 17.5 MLD STP in Elamkulam including Raw Sewage Colection Wet-well Module with pumping unit (1 no) for Block5 of Elankulam Collection System in the STP site Est. Cost: Rs 7482.00 lakh		
S. No	Description	Amount Rs in Lakh
CAPITAL COST		
1	Design, Supply & Delivery, Construction and commissioning of all allied components for Wet-well (Dia:3 m and Depth:7.30 m) Module comprising Screen cum grit wells for Block 5 of Elankulam Zone (Ultimate Peak Flow:1.86 mld @ 2055 & Intermediate flow:1.71 mld @2040) using M30 grade concrete, Sulphate Resistant Cement, Corrosion resistant steel including Pump-set, Control room sharing with nearby STP Components, control panels compatible to PLC controls compatible to 1DWF, 2 DWF and 3 DWF with stand-bye pumps, all allied pipe connections, with suitable control valves, chambers, Silt pit, silt raiser, Pumping Main of 150 mm DI K9 pipes to the adjoining inlet chamber of the STP and Odour Control Unit etc with all allied items installation complete as pe standarr specifications fand practice - 1 no	44
2	Design, Supply & Delivery, Construction and commissioning of 17.5 MLD STP for the ultimate sewage load during 2055 (Intermediate 2040: 16 MLD) with 10 year Operation & maintenance(O&M includes Wet well Sewage Pumping Station in Item1) and on Design, Build, Operate and Transfer mode based on the latest Sequential Batch Reactor Technology with Turbo Blowers having non-contact Air Foil bearings for energy savings with compatible Diffuser Assembly with highest standard specifications with minimal land and energy footprint having inbuilt plant automation including all other allied items for the best functioning of the STP comprising the requisite hierarchy of treatment units with contingent items associated thereto including Buildings with with disaster resilient design, compound wall, approach roads, storm water drains, peripheral plantations, landscaping Treated water fountain etc including aesthetic lay-outing of the plant since entry point to outfall locale congenial to the comfortable commute for O&M and the spinal functional efficacy to preserve the environment by complying the stringent effluent standards prescribed by KPCB/ CPCB for the discharge of STP treated water- Concept to Completion Cost of STP having innovative robust, engineered and energy-efficient Turbo Blowers with high quality membrane diffuser assembly to produce the desired effluent quality to achieve BOD < 5 ppm, COD < 100 ppm, TSS < 10 ppm, to get recyclable quality of water for industrial / agricultural purposes. (Plant is designed for N, P outlet parameters and also include TN < 10 ppm, Nh3N < 2 ppm and TP < 1 ppm)	3,105
2.1	Environmental Management Plan including Environmental clearance, Public consultation	25
2.2	Extending Dedicated Electrical Feeders and the connected deposits and payments payable to Kerala Electricity Board for supply of uninterrupted 24*7 power supply	247
3	Supply, delivery and installation of SCADA System for STP including collection system	306.8
4	Supply, delivery and installation of 250 KW capacity Solar Power Plant at Elamkulam	128
	Sub Total Item [1+4]	3855.83
	Provision for GST Payment @ 18%	694.05
	Total -1	4549.88

S. No	Description	Amount
		Rs in Lakh
ANNUAL MAINTENANCE FOR 10 YEARS [OPERATIONAL COST]		
5	Annual maintenance for 10 years for SCADA System for STP	73.35
6	Annual maintenance for 10 years for Installation of 250 KW capacity Solar Power Plant at Elamkulam	41.78
7	Annual Maintenance Cost of STP For 10 Years- Total: Rs 2455.86 lakh	
7.1	O& M Cost excluding Electrical Energy for 10 years	1418.78
7.2	Electrical Energy Cost for 10 years	950.41
	Sub Total [Item 5 to 7]	2,484.32
	Provision for GST Payment @ 18%	447.18
	Add for sundries	0.63
	Total -2	2932.12
	Grand Total	7482.00

(Rupees Seventy four crore and eighty two lakhs Only)

SUMMARY OF PUMPING STATION		
Sr. No	Components	Cost (Rs.)
1	Grit/Screen Chamber	15,30,112.83
2	Suction Well	13,36,936.42
4	Silt Pit	92142.71
5	Silt Raiser	40132.64
6	Valve Chamber	188825.65
7	Construction of Column & Erection of	51686.51
8	Pipe Connection,Pumpsets Pumping n	484406.6
9	Odour control mechanism	675000
		43,99,243.36
Total Cost Rs in lakh		44.00

Refer to Maharashtra State Schedule of Rates Year 2021 - 2022			
Calculating Rates for 17.5 MLD STP based on SBR Technology with Automation System - MPJ Rates 2021-22			
Planning, Design, Supply & Delivery, Construction and commissioning of 17.5 MLD STP for the ultimate sewage load during 2055 (Intermediate 2040: 16 MLD) based on the latest Sequential Batch Reactor Technology embracing highest standards and practices by aesthetic orientation including cost of all allied components of STP until functional use.			
Estimate Cost: Rs 31.05 crore			
S. No	Description		Amount Rs in Lakh
1.1	Interpolating MLD rate from MPJ rates 2021-22: (99.78-2.58= 97.20 say Rs 97.2 lakh) Reduce incremental value= (99.78-94.63)/5*2.5= 2.58, STP rated per MLD reduces when capacity increases from 15 to 20 MLD	1 MLD	97.2
1.2	Adding 5% to account of extra construction work and larger process units because of increased peak factor from 2 to 2.25 including price contingencies for 2022-23 rates	1 MLD	4.9
1.3	Adding 10% extra for Nitrogen & Phosphorous removal	per MLD	9.7
	Sub Total for 17.5 MLD SBR Technology based STP		111.8
1.4	Add 5% for work in CORPORATION Area on per MLD rate in above total		5.6
1.5	Add 5% for disaster resilience structures i.e. concrete, higher specifications in buildings Sulphate resistant Cement, corrosion resistant steel, SS 316 hand rails to protect against corrosion for 1.2 m wide walkways around the component structures for unhindered access to each unit including price contingencies due to increase cost of labour and associated items in Kerala		5.6
	Total Cost per MLD		123.0
	Total Cost of 17.5 MLD Plant based on above calculated MLD rates	1 lot	2151.8
2.1	Cost for Additional Items not covered in per MLD rate of GWSSB	-	420
	HT Substation including all additional requirements to meet high end specifications and latest		
	CG room including CG set or reputed make with latest configurations as per the design requirements including CEIG and allied statutory approvals if any until		
	cost of Compound walls, Roads and Drains etc including Peripheral plantations, compensatory afforestation, Advanced Odour systems, Treated water fountains etc complete		
	Additional cost of SS 316 Coarse/ fine Screens, Grit and Decanters and price variation thereto in excess of SS304 considered in the base cost		
2.2	Additional cost for Lab equipment		45
2.3	Add for Site levelling and Soil stabilisation to improve SBC, Special/Pile footings, Architectural lay outting of Buildings, landscaping, Fountains, Aesthetical design finishes, 3 D modelling of the Plant/ STP etc complete to defray the site constraints and variations		290
	Total for STP with Tri-Lobe Blowers and PU Disc membrane Diffuser Assembly		2906.8

S. No	Description		Amount Rs in Lakh
2.4	Add for higher specifications with modern Air diffusion Technology having High speed Turbo Aerators/Blowers with with non-contact, noise-less Air foil bearings to produce energy savings in place of lobe blowers. It is the latest technology, low vibration, noiseless and suitable for STPs in residential areas including. Additional cost includes price contingencies for high quality Membrane Diffusers compatible to turbo aeration to bring in maximum energy savings, less noise and efficacy in functioning		135
2.5	Add for higher specifications for diffuser Piping with SS316 laterals to adopt better quality newer materials with lesser Maintenance cost in excess of the diffuser Assembly considered in the base cost including price differential for latest Screw Press for Sludge dewatering to ensure highest standards with lesser energy footprint, improved functional efficacy and ease of operation & Maintenance		63.2
	Total for STP with Turbo Blowers with SS316 Diffuser pipes & latest Dewatering Technology with Screw Press		3105.0

(Rupees thirty one cores and five lakh only)

INR 31.05 crore

SCADA COMPONENTS & ESTIMATES					
List of SCADA Components					
Sl.No.	Description	Qty.	Unit	Unit Price	Total Price
1	RAW SEWAGE - WATER QUALITY SENSOR AND DISPLAY UNIT				
1a	BOD ₅	1	No.	19,80,000	19,80,000
1b	COD	1	No.		
1c	TSS	1	No.		
1d	TKN (as N)	1	No.		
1e	TP (as PO ₄)	1	No.		
2	TREATED SEWAGE - WATER QUALITY SENSOR AND DISPLAY UNIT				
2a	BOD ₅ @ 20° C	1	No.	19,80,000	19,80,000
2b	COD	1	No.		
2c	TSS	1	No.		
2d	TN (as N)	1	No.		
2e	TP (as PO ₄)	1	No.		
3	Raw Sewage Receiving Chamber				
	Sewage Level Sensor	1	No.	78,000	78,000
4	COARSE SCREEN CHANNEL: MECHANICAL				
4a	Head Loss across Screen - Sensor	1	Set	78,000	78,000
5	COARSE SCREEN CHANNEL: MANUAL				
5a	Head Loss across Screen	1	Set	78,000	78,000
6	Raw Sewage Pumping Station				
6a	Mechanical Coarse Bar Screen - Starter (1.5kW)(1W)	1	No.	65,000	65,000
6b	Flat Belt Conveyor - Starter (1.5kW)(1W)	1	No.	65,000	65,000
6c	Raw Sewage Pump-1 - VFD Starter Panel (11kW) (1W+1SB)	2	Nos.	1,48,000	2,96,000
6d	Raw Sewage Pump-2 - VFD Starter Panel (7.5kW)(1W+1SB)	1	Nos.	1,25,000	1,25,000
6e	Level Sensor	3	Nos	45,000	1,35,000
6f	Pressure Sensor	3	Nos	18,900	56,700
6g	Sensor Hook up System	6	lot	23,500	1,41,000
7	STP				
7a	Mechanical Fine Bar Screen (1.5 kW) - VFD Starter Panel (1W)	1	No.	65,000	65,000
7b	Flat Belt Conveyor - (1.5kW) VFD Starter Panel (1W)	1	No.	65,000	65,000
8	Grit Chamber				
8a	a. Scraper Mechanism - VFD Starter Panel (1.5 kW) (2W)	2	Nos	65,000	1,30,000
8b	b. Classifier Mechanism - VFD Starter Panel (2.2 kW) (2W)	2	Nos	69,000	1,38,000
8c	c. Organic Return Pumps - VFD Starter Panel (1.5 kW) (2W+2SB)	4	Nos	65,000	2,60,000
8d	SBK Air Blowers (11-Lobe Blowers) - VFD Starter Panel (100kW) (2W)	2	Nos	5,02,000	10,04,000
8e	RAS Pumps - VFD Starter Panel - 7.5kW (2W)	2	Nos	1,25,000	2,50,000
8f	Decanters - VFD Starter Panel - 0.55kW (2W)	2	Nos	55,000	1,10,000
8g	SAS Pumps - VFD Starter Panel - 11kW (2W)	2	Nos	1,48,000	2,96,000
8h	Auto Valves/Sluice Gates - Motorized Actuator (0.55) (8W)	8	Nos	55,000	4,40,000
8i	Level Sensor	1	No.	45,000	45,000
8j	Pressure Sensor	3	Nos.	18,900	56,700
8k	Sensor Hook up System	4	lot	23,000	92,000
9	Chlorination System				
9a	a. Water Booster Pumps - VFD Starter Panel - 2.2kW (1W+1SB)	2	Nos	69,000	1,38,000
9b	b. NaOH Recirculation Pump - VFD Starter Panel - 2.2kW (1W)	1	Nos	69,000	69,000
9c	c. Air Blower - VFD Starter Panel - 1.5kW (1W)	1	Nos	65,000	65,000
9d	Residual Chlorine sensor	1	No.	73,000	73,000
9e	Free Chlorine Sensor	1	No.	67,800	67,800
9f	Level Sensor	2	Nos	45,000	90,000
9g	Pressure Sensor	3	Nos.	18,900	56,700
9k	Sensor Hook up System	7	lot	23,800	1,66,600

10	Sludge Transfer, Dewatering & Thickening				
10a	Sludge Sump Mixers VFD Starter Panel - 3.7kW (2W)	2	Nos	98,000	1,96,000
10b	Centrifuge - VFD Starter Panel - 22kW (1W+1SB)	2	Nos	2,37,000	4,74,000
10c	Centrifuge Feed Pumps - VFD Starter Panel - 7.5kW(1W+1SB)	2	Nos	1,25,000	2,50,000
11	Dewatering Polymer Dosing System				
11a	a. Agitators for Dosing Tanks - VFD Starter Panel - 0.75kW (2W)	2	Nos	52,000	1,04,000
11b	b. Dosing Pumps - VFD Starter Panel- 0.75kW (1W+1SB)	2	Nos	52,000	1,04,000
11c	Service Water Pumps - VFD Starter Panel - 3.7kW (1W+1SB)	2	Nos	98,000	1,96,000
11d	Level Sensor	2	Nos	98,000	1,96,000
11e	Pressure Sensor	3	Nos.	18,900	56,700
11f	Sensor Hook up System	5	lot	23,900	1,19,500
12	RTU/PLC Panel				
12a	RTU/PLC Panel	1	No.	7,89,000	7,89,000
12b	Battery Power Back-up	1	set	2,45,000	2,45,000
12c	GSM-GPRS unit	1	No.	12,000	12,000
12d	Antenna	1	No.	8,900	8,900
12e	Earth Pit	3	No.	22,500	67,500
12f	Field Cable	1	Lot		-
12g	Monitoring and Control Unit	1	No.	5,67,800	5,67,800
12h	SCADA Software	1	No.	3,28,000	3,28,000
12i	solar Power back-up for the electronics unit	1	No.	3,45,000	3,45,000
13	SEWAGE COLLECTION AND PUMPING SYSTEM				
	LM-1 TO LM - 7				
13a	Sewage Pumping System from the collection sump - VFD Starter Panel - 4 kW	14	Nos.	1,20,000	16,80,000
13b	RTU/PLC PANEL Integration with GSM-GPRS system to STP SCADA System with 24 Hour Power Back-up	14	No.	1,79,000	25,06,000
13c	Level Sensor	14	No.	45,000	6,30,000
13d	Pressure Sensor	14	No.	18,900	2,64,600
13e	Multi-function energy fitted inside the VFD starter panel with Current Transformer	14	No.	23,000	3,22,000
13f	Maintenance Free Power & Signal Earth	14	Nos,	22,500	3,15,000
13g	Field Signal Cable (Power cables are not included)	14	Lot	19,000	2,66,000
14	WW-1 to WW-2				
14a	WW-1 to WW-2 - VFD Starter Panel - 11 kW (1W+1SB)	2	Nos.	1,48,000	2,96,000
14b	VFD Starter Panel 7.5kW (1W)	1	No.	1,25,000	1,25,000
14c	RTU/PLC PANEL Integration with GSM-GPRS system to STP SCADA System with 24 Hour Power Back-up	1	No.	1,79,000	1,79,000
14d	Level Sensor	1	No.	45,000	45,000
14e	Pressure Sensor	1	No.	18,900	18,900
14f	Multi-function energy fitted inside the VFD starter panel with Current Transformer	1	No.	26,000	26,000
14g	Maintenance Free Power & Signal Earth	2	Nos,	22,500	45,000
15	WW-2 to STP				
15a	WW-2 to STP- VFD Starter Panel - 11 kW (1W+1SB)	2	Nos.	1,48,000	2,96,000
15b	VFD Starter Panel 7.5kW (1W)	1	No.	1,25,000	1,25,000
15c	RTU/PLC PANEL Integration with GSM-GPRS system to STP SCADA System with 24 Hour Power Back-up	1	No.	1,79,000	1,79,000
15d	Level Sensor	1	No.	45,000	45,000
15e	Pressure Sensor	1	No.	18,900	18,900
15f	Multi-function energy fitted inside the VFD starter panel with Current Transformer	1	No.	26,000	26,000
15g	Maintenance Free Power & Signal Earth	2	Nos,	22,500	45,000

16	WW-3 to KWA Well (Cheruparambath)				
16a	WW-3 to KWA Well (Cheruparambath)- VFD Starter Panel - 11 kW (1W+1SB)	2	Nos.	1,48,000	2,96,000
16b	VFD Starter Panel 7.5kW (1W)	1	No.	1,25,000	1,25,000
16c	RTU/PLC PANEL Integration with GSM-GPRS system to STP SCADA System with 24 Hour Power Back-up	1	No.	1,79,000	1,79,000
16d	Level Sensor	1	No.	45,000	45,000
18e	Pressure Sensor	1	No.	18,900	18,900
16f	Multi-function energy fitted inside the VFD starter panel with Current Transformer	1	No.	26,000	26,000
16g	Maintenance Free Power & Signal Earth	2	Nos,	22,500	45,000
17	WW-4 to STP				
17a	WW-4 to STPVFD Starter Panel - 11 kW (1W+1SB)	2	Nos.	1,48,000	2,96,000
17b	VFD Starter Panel 7.5kW (1W)	1	No.	1,25,000	1,25,000
17c	RTU/PLC PANEL Integration with GSM-GPRS system to STP SCADA System with 24 Hour Power Back-up	1	No.	1,79,000	1,79,000
17d	Level Sensor	1	No.	45,000	45,000
17e	Pressure Sensor	1	No.	18,900	18,900
17f	Multi-function energy fitted inside the VFD starter panel with Current Transformer	1	No.	26,000	26,000
17g	Maintenance Free Power & Signal Earth	2	Nos,	22,500	45,000
18	WW-5				
18a	WW-4 to STPVFD Starter Panel - 11 kW (1W+1SB)	2	Nos.	1,48,000	2,96,000
18b	VFD Starter Panel 7.5kW (1W)	1	No.	1,25,000	1,25,000
18c	RTU/PLC PANEL Integration with GSM-GPRS system to STP SCADA System with 24 Hour Power Back-up	1	No.	1,79,000	1,79,000
18d	Level Sensor	1	No.	45,000	45,000
18e	Pressure Sensor	1	No.	18,900	18,900
18f	Multi-function energy fitted inside the VFD starter panel with Current Transformer	1	No.	26,000	26,000
18g	Maintenance Free Power & Signal Earth	2	Nos,	22,500	45,000
16	Electrical Hoist with Travelling Trolley				
16a	a. 5 HP (4 Nos)				
17	Utility				
17a	Plant Area Lighting				
				Basic Total	2,24,73,000
				Installation and Commissioning charges @ 12%	26,96,760
				Transport Charges @ 5%	1123650
				Insurance @ 0.6%	134838
				Financial Charges @ 2%	449460
				Other @ 2%	4,49,460
				Sub Total	3,06,82,963
				GST 18%	55,22,933
				Total	Rs 362.06 lakh
					3,62,05,897

1.7	O & M COST FOR 10 YEARS (EXCLUDES POWER COST)	
SL NO	PARTICULAR	COST Rs. Lacs/year
1	O & M Cost for 1st Year	Nil
2	O & M Cost for 2nd Year	Nil
3	O & M Cost for 3rd Year (@ 5% increament per year)	6,74,190.00
4	O & M Cost for 4th Year (@ 5% increament per year)	7,07,899.50
5	O & M Cost for 5th Year (@ 5% increament per year)	7,43,294.48
6	O & M Cost for 6th Year (@ 10% increament per year)	8,17,623.92
7	O & M Cost for 7th Year (@ 10% increament per year)	8,99,386.31
8	O & M Cost for 8th Year (@ 10% increament per year)	9,89,324.95
9	O & M Cost for 9th Year (@ 15% increament per year)	11,37,723.69
10	O & M Cost for 10th Year (@ 20% increament per year)	13,65,268.43
	GRAND TOTAL	73,34,711.27

6,74,190.00

SOLAR PLANT 250 KW CAPACITY & ESTIMATES					
Solar Plant 250 KW Capacity in Elamkulam STP Site & Estimates					
S.No.	Description	Qty.	Unit	Unit Price Rs	Total Price Rs
	1.Solar Plant 200 KW Capacity in Elamkulam STP Site				
1.1	Of Supply, Delivery and InstallationSolar Power unit of 200KW using an array of Solar panels of 535-650 W capacity or higher to conserve space				
	Cost of Solar Plant KW	250	1 KW	50,000	1,25,00,000
1.2	Statutory approvals including CEG, Safety Certification and Online NoC etc	1 lot	-		3,00,000
1.3	Total Base cost				1,28,00,000.00
	2. Annual Maintenance Cost of 200 KW Solar plant in Elamkulam STP site				
2.1	Annual Maintenance @ 3% of the Base cost for 1 year	12800000		0.03	3,84,000
2.2	Annual Maintenance for 10 years	Rs 41.78 cr			41,77,649
	3.Cost Savings from Solar Energy produced				
3.1	Total Energy harvested per day	250	1 KW	4 unit	1,000
3.2	Energy savings @ Rs 6.1 charged for the EB grid per day	1,000	1 unit	6.1 per unit	6,100
3.3	Annual Energy Savings during the 1 st year	30*12		4,880	21,96,000
3.4	Annual Energy Savings for 10 years	Rs 21.96 lakh			21,96,000

1.1 ESTABLISHMENT CHARGES						
SL. No	Location	Description	Nos	Wage/Month	Cost per Month	Cost /Month- Annum
1	ELAMKULAM SEWERAGE TREATMENT PLANT : 17.5 MLD	Plant Engineer/Manger	1	30,000.00	30,000.00	
3		Chemist	1	25,000.00	25,000.00	
4		Lab Assistant			-	
5		Mechanic/Fitter	1	18,000.00	18,000.00	
6		Electrician / Plant Operators	3	18,000.00	54,000.00	
7		Helpers	5	15,000.00	75,000.00	
8		Gardener/Sweeper/Watchman	3	10,000.00	30,000.00	
		Total	15 nos		2,32,000.00	27,84,000.00
		Add contractor's profit 15% Total			2,66,800.00	32,01,600.00
Establishment Cost For Annual Maintenace = Rs 32.02 lakh						

1.2. CHEMICAL								
SL NO	CHEMICAL	FLOW in MLD	UNIT	DOSAGE	UNIT	QTY Kg/day	UNIT RATE Rs.	AMOUNT Rs.
1	Chlorine @ 5 mg/l	16.00	MLD	5.00	mg/l	80	18.00	1,440.00
2	Dewatering Polymer @ 2.0 Kg/Ton of Dry Solids	3.400	MT	1.50	Kg/MT	5	350.00	1,785.00
	TOTAL (Rs./day)							3,225.00
	TOTAL Rs/ Month							99,975.00
	TOTAL (Rs/year)							11,99,700.00
		Add contractor's profit 15% Total						13,79,655.00
Cost of Chemicals per Annum= Rs 13.79 lakh								

1.3. RESIDUAL DISPOSAL of SCREENINGS, GRIT AND DEWATERED SLUDGE						
SL NO	DESCRIPTIPON	FLOW in MLD	UNIT	QTY Cum/day	UNIT RATE Rs./Cum	AMOUNT Rs.
1	Dewatered Sludge Qty (m3/day) = Sludge (Kg/day) / Consistency (20%) / 1000	16.00	MLD	14.00	200.00	2,800
	Coarse Screenings @ 15 Litres/MLD Qty (m3/day) = Flow (MLD) x 0.015	16.00	MLD	0.240	200.00	48
2	Fine Screenings @ 45 Litres/MLD Qty (m3/day) = Flow (MLD) x 0.045	16.00	MLD	0.720	200.00	144
3	Grit @ 0.05-0.15 Cum/MLD Qty (m3/day) =Flow (MLD) x 0.1	16.00	MLD	1.600	200.00	320
	TOTAL (Rs./day)					3,312.00
	Total/Month					99,360.00
	TOTAL (Rs./year)					11,92,320.00
	Total/per year with CoP 15%					13,71,168.00
Cost of Residual Disposal = Rs 13.71 lakhs						

1.4. MAINTENANCE (Capital Cost=44+3105-290-182=2677 Civil: Rs 1267 lakh, EMI: 1410 lakh)				
SL NO	DESCRIPTION	CAPITAL COST Rs.	RATE	ANNUAL MAINTENANCE COST Rs.
1	Civil Works @ 0.5 % of Capital Cost	12,67,00,000.00	0.50%	6,33,500
2	Mechanical, Electrical & Instrumentation Works @ 2% of Capital Cost	14,10,00,000.00	2.00%	28,20,000
	TOTAL (Rs./year)			34,53,500
Cost of Maintenance = Rs 34.54lakh				

Elankulam STP 17.5MLD - Power Load List of Component Units @ Elankulam STP site								
S NO	Pumping Plant/Equipment	HP Inst.	No. of Units			Installed HP		
			Working	S	T	Working	S	Total HP
1	Raw Sewage Transfer Pumps- VFD							
	1 DWF/2 DWF	5	1	2	3	5	10	15
	3 DWF	1	1	0	1	5	0	5
STP Components and Units								
	Preliminary Treatment Units							
1.1	Coarse & Fine Screens							
a	Mechanical Coarse Bar Screen	2	1	0	1	2	0	2
b	Flat Belt Conveyor	2	1	0	1	2	0	2
1.2	a) Fine Screens							
	b) Mechanical Fine Bar Screen	2	1	0	1	2	0	2
	c) Flat Belt Conveyor	2	1	0	1	2	0	2
2	Grit Removal Mechanism- Detritors							
a	Grit Collection Mechanism	2	2	1	3	3	1.5	4.5
b	Grit Washing/Classifier Mechanism	2	2	1	3	4	2	6
c	Organic Return Pumps	1	1	1	2	2	2	4
3	Secondary Treatment Unit- SBR Air Diffusion							
a	Air Blowers- VFD	220	2	1	3	440	220	660
b	RAS Pumps	10	2	0	2	40	0	40
c	Decanters	0.75	2	0	2	1.5	0	1.5
d	SAS Pumps	15	2	0	2	30	0	30
e	Auto Valves/Sluice Gates	1	8	0	8	8	0	8
4	Chlorination System							
a	Water Booster Pumps	3	1	1	2	3	3	6
b	NaOH Recirculation Pump	3	1	0	1	3	3	6
b	c. Air Blower	2	1	0	1	2	2	4
5	Sludge Transfer, Dewatering & Thickening							
a	Sludge Sump Mixer	5	2	0	2	10	0	10
b	Screw Press Sludge dewatering /Thickening- VFD	10	1	1	2	10	10	20
c	Sludge Feed Pumps	7.5	1	1	2	7.5	7.5	15
5.1	Dewatering Polymer Dosing System							
a	Agitators for Dosing Tanks	1.5	2	0	2	3	0	3
b	Dosing Pumps	2	1	1	2	2	2	4
6	Service Water Pumps	5	1	1	2	5	5	10
7	Electrical Hoist with Travelling Trolley	3	4	0	4	12	0	12
8	Plant Area Lighting	10	1	0	1	10	0	10
	GRAND TOTAL		43	11	54	614	268	882

1. Capacity of transformer:

Working Load in HP 614
 Buffer load in the existing site & 10 % additional 86 700 HP
 Power Load in KW (700*0.746) = 522 KW 523 KW
 Transformer Load in KVA @ PF 0.8= 654 654 KVA
 Adopt nearest KVA of 800 KVA for Transformer
Provide 800 KVA Transformer (1 working +1 standby)

2. Capacity of DG Gen-Set

Installed Power Load = 614 HP
 Power Load in KW (614*0.746) = 459
 KVA Rating @ PF of 0.9 = 510 KVA

Provide 600 KVA DG Gen-set

ENERGY DEMAND & CONSUMPTION COST FOR ELAMKULAM 17.5 MLD STP				
S.No	Description	Value	Unit	Remarks
1	Transformer Capacity Design			
1.1	Transformer connected load(with10% Margin & Buffer load in the existing site)	523	KW	
1.2	Calculation of transformer capacity with 0.8PF	654	KVA	
1.3	Capacity of Transformer proposed as per nearest rating is 800 KVA	800	KVA	
2	Calculation of Electrical Energy demand and energy Consumption			
2.1	Electrical Energy Demand			
a	Working Load	523	KW	
b	Average working hours @ full load / day	5.90	hours	
c	Total energy consumption per day	3,086	KWH	
d	Monthly consumption	3086x30	KWH	
e	Energy Consumption per month	92,571.00	KWH	
3	Electrical Energy cost			
5.1	KVA demand charge (310 Rs/KVA)	800*310	Rs	
		Rs2,48,000/-		
5.2	Energy charges (RS 6.10/KWH)	92571x6.10	Rs	
		5,64,683	Rs	
	Total charges payable (A+B) per Month	₹ 8,12,683	Rs	
	Energy charges payable /annum	₹ 97,52,196	Rs	9752196

ELAMKULAM STP Annual Maintenance Estimate & Electricity Charges

S.No	Item description	Establishment (A)	Chemicals (B)	Residues (B)	Maintenance (C)	Electrical Energy Charges (D)	SCADA AME	Solar Power savings	Solar AME	Genset AME
1	AM for 1st Year Estimate	32,01,600.00	13,79,655.00	13,71,168.00	Nil	97,52,196	Nil	21,96,000	Nil	23,40,000
2	AM for 2nd Year	33,61,680.00	14,48,637.75	14,39,726.40	Nil	1,02,39,805.80	Nil	23,05,800	Nil	24,57,000.00
3	Annual Mace for 3rd Year (5 % increase)	35,29,764.00	15,21,069.64	15,11,712.72	34,54,000.00	1,07,51,796.09	6,74,190.00	24,21,090	3,84,000.00	25,79,850.00
4	Annual Mace for 4th Year (5 % increase)	37,06,252.20	15,97,123.12	15,87,298.36	36,26,700.00	1,12,89,385.89	7,07,899.50	25,42,145	4,03,200.00	27,08,842.50
5	Annual Mace for 5th Year (5 % increase)	38,91,564.81	16,76,979.28	16,66,663.27	38,08,035.00	1,18,53,855.19	7,43,294.48	26,69,252	4,23,360.00	28,44,284.63
6	Annual Mace for 6th Year (10 % increase only for Maintenance, Others 5%)	40,86,143.05	17,60,828.24	17,49,996.44	41,88,838.50	1,24,46,547.95	8,17,623.92	28,02,714	4,65,696.00	29,86,498.86
7	Annual Mace for 7th Year (10 % increase)	42,90,450.20	18,48,869.65	18,37,496.26	46,07,722.35	1,30,68,875.35	8,99,386.31	29,42,850	5,12,265.60	31,35,823.80
8	Annual Mace for 8th Year (10 % increase)	45,04,972.71	19,41,313.13	19,29,371.07	50,68,494.59	1,37,22,319.11	9,89,324.95	30,89,993	5,63,492.16	32,92,614.99
9	Annual Mace for 9th Year (15 % increase)	47,30,221.35	20,38,378.79	20,25,839.63	58,28,768.77	1,44,08,435.07	11,37,723.69	32,44,492	6,48,015.98	34,57,245.74
10	Annual Mace for 10th Year (20 % increase)	49,66,732.42	21,40,297.73	21,27,131.61	69,94,522.53	1,51,28,856.82	13,65,268.43	34,06,717	7,77,619.18	36,30,108.03
	Total AMC for 10 Years	4,02,69,380.74	1,73,53,152.33	1,72,46,403.75	3,75,77,081.74	12,26,62,073.27	73,34,711.27	2,76,21,052.01	41,77,648.92	2,94,32,269
		402.69	173.53	172.46	375.77	1,226.62	73.35	276.21	41.78	294.32
<p>NB: i) Annual increase is 5% uniform for Establishment, Chemicals and Electricity</p> <p>ii) The annual cost for Maintenance progressively increases by 5% upto 5th year</p> <p>10% for 6th to 8th, and 15% for 8th and 20% for 10th year</p>										

Annual Maintenance Estimate Cost for O& M [Rs in Lakh]			
S.No	Item	AME for 1 st year	AME for 10 years
1.1	Manpower	32.02	402.69
1.2	Chemicals	13.80	173.53
1.3	Residue Disposal	13.71	172.46
1.4	Maintenance	34.54	375.77
1.5	Genset Fuel	23.40	294.32
	Total O&M excluding Solar and SCADA	117.46	1,418.78
1.6	SCADA	6.74	73.35
1.7	Solar	3.84	41.78
1.8	Total O&M excluding Electrical charges	128.05	1,533.91
a	Electrical Energy	97.52	1226.62
b	Solar Savings	21.96	276.21
1.9	Net Electrical energy Cost for AME(a-b)	75.56	950.41

ELAMKULAM STP-From Wet Well@STP to IC@STP								
Detailed Estimate -SCREEN/GRIT WELL (3m dia)								
Sr. No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
1	Earth work excavation in hard stiff clay, stiff black cotton, hard red earth, shales, murum, gravel, stoney earth or earth mixed with small size boulders and hard gravelly soil as per SS20B with initial lead of 10m and lift of 2m etc. complete.							
a	For 0 to 2 m depth	$\pi/4$	5.10	5.10	2.00	40.86	41.00	cu.m
2	Providing form work with centering for somits of reinforced cement concrete slabs or plain surfaces including shuttering for RCC well curb and well steining.							
	Upto 1m above and 3m below GL							
a	well Kerb - inner	1	π	3.00	0.45	4.24		
b	well Kerb - outer	1	π	4.05	1.05	13.36		
c	well Kerb- slope	1	3.00	3.38	0.71	14.22		
d	Side wall	2	π	3.45	6.30	136.57		
	Total					168.39	169.00	sq.m
3	Providing and laying in position machine batched machine mixed and machine vibrated design mix. Sulphate resistance cement concrete M30 grade for reinforced cement concrete structural elements under controlled water cement ratio with plasticiser using 20mm and down graded machine broken granite stone jelly excluding the cost of centering and shuttering and reinforcement but including curing etc. as per standard specification and as directed at site							
	Up to 1.5m Below & 1.0m above ground level							
	Side Wall	1	$\pi()$ 3.45	0.45	6.30	30.73	31.00	cu.m
	From 1.5m to 4.5m below ground level							
	kerb	1	$((0.525*0.45)+(0.15*0.6)+(0.5*(0.525-$			4.86	5.00	cu.m
	From 4.5m to 9.0m below ground level							
	Bottom Slab	1	$3.14/4 \times 3^2$		0.45	3.18	4.00	cu.m
4	C.C 1:1.5:3 using 20mm gauge hard broken stone jelly for PCC works using Sulphate resistance cement including laying, ramming, curing etc complete for benching and channeling as directed.							
	Benching							
i)	4.5m to 9m depth	1	3.00	3.00	0.25	1.77	2.00	cu.m
5	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1	3.9	16.9	kg/m	207.1	207.10	kg
6	Sinking of well below water level including all incidental charges using special tools and plants such as air compressor, helmet etc., complete and including baling out water.							
	3m dia well							
a	First depth of 2m					2	2.00	m
b	Second depth of 2m					2	2.00	m
c	Third depth of 2m					0.35	0.35	m

Sr. No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
7	Plugging the bottom of the well using C.C 1:3:6 using 40mm gauge hard broken stone jelly with 10% excess cement for plain cement concrete works including laying in layers of not more than 15cm thick including ramming curing etc complete							
i)	4.5m to 9m depth	1	3.14x3.45^2/4		0.30	2.12	2.20	cu.m
8	Supplying, fabricating CRS bars manufactured by Primary steel including cost of steel, binding wire, cutting, cranking and tying, in position with binding wire assembly etc complete.	1	38.77	120	kg/cum	4,652.01		
	wastage at 2.5%					117.00		
						4,769.01	4800.00	kg
9	Refilling with excavated earth complying with standard specifications for filling in foundations & basement other than sand including watering & consolidating etc.,							
	Earthwork quantity					40.86		
	Volume of the well	1	3.14/4x3.9^2		2.00	14.14		
	Total					26.72	27.00	cu.m
10	Disposal of surplus earth							
	Earthwork quantity	1				40.86		
	For sinking well	$\pi/4$	3.90	3.90	3.60	43.01		
	Deduct for Refilling quantity					(26.72)		
	Total					57.14	58.00	cu.m
11	Supplying and fixing C.I.steps.	1				21.00	21.00	nos
12	Colour washing two coats over one coat of white washing							sq.m
	a)well outer	1	3.14	3.90	1.00	12.25		
	b)top of wall thickness	1	3.14	3.45	0.45	4.87		
						17.12	18.00	sq.m
13	Supplying and fixing SS screen of grade 316. The screen shall be fabricated out of stainless steel flats of 50 x 10mm. The outer frame also shall be of 50 x 10mm fixed inside the well for seating the screen. The screen shall be so fabricated that the inclined portion of the screen is fixed and the horizontal portion of the screen is a removable one for lifting the							
	outer frame and 50x10mm SS flats spaced at 25mm centre to centre to serve bar screens inside the screen well							
	50mmx10mm flats at 25 mm spacing	29	1.00			113.68		
	Area of slant screen		3m x 1.5m			4.5	sq.m	
	total weight of flats					511.56	512.00	
	50 x 10mm SS for outer frame	1	9.00			35.28	36.00	
						Total	548.00	
			Total wt of frame				548.00	Kg
13	Supply and erection of Cast Iron single faced manually operated rising type 200mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangement and hand wheel fitted in well.					1.00	1.00	no

ELAMKULAM STP-From Wet Well@STP to IC@STP								
DETAILED ESTIMATE-SUCTION WELL (3 m dia)								
Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
1	Earth work excavation in hard stiff clay, stiff black cotton, hard red earth, shales, murum, gravel, stoney earth or earth mixed with small size boulders and hard gravelly soil as per SS20B with initial lead of 10m and lift of 2m etc. complete.							
a	For 0 to 2 m depth	$\pi/4$	5.00	5.00	2.00	39.27	40.00	cu.m
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including shuttering for RCC well curb and well steining							
	Upto 1m above and 3m below GL							
a	well Kerb - inner	1	π	3.00	0.45	4.24		
b	well Kerb - outer	1	π	4.05	1.05	13.36		
c	well Kerb - slope	1	3.00	3.38	0.71	14.22		
d	Side wall	2	π	3.45	7.69	166.70		
	Total					198.52	199.00	sq.m
3	Providing and laying in position machine batched, machine mixed and machine vibrated design mix. Sulphate resistance cement concrete of M30 grade for reinforced cement concrete structural elements under controlled water cement ratio with plasticiser using 20mm and down graded machine broken granite stone jelly excluding the cost of centering and shuttering and reinforcement but including curing etc as per standard specification							
	Up to 1.5m Below & 1.0m above ground level							
	Side wall	1	π	0.45	7.69	37.51		
						37.51	38.00	m3
	From 1.5m to 4.5m below ground level							
	kerb	1	$((0.525*0.45)+(0.15*0.6))+$			1.57	2.00	m3
	From 4.5m to 9.0m below ground level							
	Bottom Slab	1	$3.14/4 \times 3^2$		0.45	3.18	4.00	m3
4	C.C 1:1.5:3 using 20mm gauge hard broken stone jelly for PCC works using Sulphate resistance cement including laying, ramming, curing etc complete for benching and channeling as directed.							
	Benching							
i)	4.5m to 9m depth	1	3.00	3.00	0.25	1.77	2.00	m3
5	Providing point edge to well curb using ISA 150x75x10 mm of weight 16.9 kg/m	1	3.9	16.9	kg/m	207.06	207.10	kg
6	Sinking of well below water level including all incidental charges using special tools and plants such as air compressor, helmet etc., complete and including baling out water.							
	3m dia well							
a	First depth of 2m					2	2.00	m
b	Second depth of 2m					2	2.00	m
c	Third depth of 2m					1.74	1.74	m
d	Fourth depth of 2m					0	-	m

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
7	Plugging the bottom of the well using C.C 1:3:6 using 40mm gauge hard broken stone jelly with 10% excess cement for plain cement concrete works including laying in layers of not more than 15cm thick including ramming curing etc complete							
i)	4.5m to 9m depth	1	3.14x3.45 ² /4		0.30	2.80	2.90	m3
8	Supplying, fabricating CRS bars manufactured by Primary steel including cost of steel, binding wire, cutting, cranking and tying, in position with binding wire assembly etc complete.	1	42.3	120	kg/cum	5,071.15		
	wastage at 2.5%					127.00		
						5,198.15	5,200.00	kg
11	Refilling with excavated earth complying with standard specifications for filling in foundations & basement other than sand including watering & consolidating etc.,							
	Earthwork quantity					39.27		
	Total volume of the well	1	3.14/4x3.9 ²		2.00	14.14		
	Total					25.13	26.00	m3
12	Disposal of surplus earth							
	Earthwork quantity	1				39.27		
	For sinking well	$\pi/4$	3.90	3.90	5.74	68.57		
	Deduct for Refilling quantity					(25.13)		
	Total					82.71	83.00	m3
13	Supplying and fixing C.I.steps.	1				25.63	26.00	nos
14	Colour washing two coats over one coat of white washing							
a)	well outer	1	3.14	3.90	1.00	12.25		
b)	top of wall thickness	1	3.14	3.45	0.45	4.87		
						17.12	18.00	m2

Sl.No	Description of item	No.	L (m)	B (m)	D (m)	Quantity	Total	
15	Supply and erection of Cast Iron single faced manually operated rising type 200mm dia penstock conforming to relevant IS with IS markings on it, having cast iron door and frame with Gunmetal seating, spindle made of Stainless steel, CI head stock with gear arrangement and hand wheel fitted in well.					-	-	no
9	cement for 20mm thick including curing etc complete.(well inner)							
a)	Well inner	1	3.14x3		7.69	72.48		
b)	Well floor	1	3.14x3^2/4			7.07		
						79.55	80.00	m2
10	Plastering with C.M.1:3 for 12mm thick including curing etc complete.(well outer)							
15	Supply and installation of SS open mesh flooring with 25x6mm thick flats for outer frame and 25x3mm SS and 12x3mm SS flats spaced at 30mm and 60mm respectively and 50x10mm SS flats for mesh support and 50x50x6mm SS angle for opening forming a mesh over the surface of the well etc,complete							
	Area of pumping station	1				11.940	12.00	sq. mt
	kg of steel per sqm for							
	25 x 3 flats at 30 mm spacing	33	1	33.00		19.47		
	12 x 3 flats at 60 mm spacing	17	1	17.00		4.76		
					Total	24.23	24.23	kg
	Total area					290.76	290.76	kg
	25 x6 SS for outer frame	1				14.46	14.46	
	SS 50mmx 10mm Flat, 2 nos. @ 3.92 Kg/m	2	3.90			30.58	30.58	
	SS 50mmx 50mm Angle x 6mm for opening frame , @ 4.47 Kg/m	1	4.60			20.56	20.57	
	Misc. items for opening frame	1				10.00	10.00	
						Total	366.37	kg
						Say	367.00	kg

DETAILED ESTIMATE-SILT PIT - 1.5 m x 1.5 m x 1.2 m								
SL. NO	DESCRIPTION OF WORK	NO	L (m)	B (m)	D (m)	QTY	TOTAL	
1	Earth work excavation	1	2.80	2.80	1.65	12.94	13.00	cu.m
2	Sand filling	1	2.80	2.80	0.15	1.18	2.00	cu.m
3	PCC 1:3:6 , 40mm B.G	1	2.20	2.20	0.10	0.48	1.00	cu.m
4	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft	1	2.00	2.00	0.20	0.80		
		2	2.00	0.25	1.20	1.20		
		2	1.50	0.25	1.20	0.90		
	Baffle wall	1	1.50	0.10	0.95	0.14		
						3.04	4.00	cu.m
5	Steel for RCC work	1	3.0425 x 100 kg / cu.m			304.25	305.00	kg
6	Providing formwork							
	Base slab side	4	2.00		0.20	1.60		
	Inner side	4	1.50		1.20	7.20		
	Outer side	4	2.00		1.20	9.60		
	Baffle wall	2	1.50		0.95	2.85		
					Total	21.25	22.00	sq.m
9	Refilling with excavated soil							
	Total Excavation	1				12.94		
	Deduction							
	Sand filling					1.18		
	PCC	1				0.48		
	RCC	1				3.04		
	Pit Size	1	1.50	1.50	1.20	2.70		
						5.53	5.54	cu.m
10	Disposal of earth work							
	Excavation	1				12.94		
	Refilling	1				5.53		
						7.40	7.41	cu.m

ABSTRACT ESTIMATE- SILT RAISER ARRANGEMENTS			
SL. NO	DESCRIPTION OF WORK	NO. OR QTY	
1	Supplying, conveying and fixing the following CI specials as per IS 1538 etc. complete.		
	From Desilting pump to silt pit		
a	100mm dia D/F CI Pipe -0.5m length	2.00	Nos.
b	100mm dia D/F CI Pipe -1.0m length	2.00	Nos.
c	100mm dia D/F CI Pipe -2.0m length	2.00	Nos.
d	100 mm dia D/F CI bend 90° bend	2.00	Nos.
e	100 mm D/F 90oDuck Foot Bend	1.00	No.
2	Supplying and laying 100 mm dia CI D/F pipe - 2m length including earthwork excavation in all kinds of soil, including refilling the excavated earth etc. complete.	2	nos.
3	Making flanged joints -100 mm dia including cost of jointing materials	11.00	nos.
4	Supplying, laying , jointing and testing 110 mm dia UPVC pipes SN8-SDR 34(S 16.5) AS PER IS 15328/2003 pipe including earthwork excavation for trenches in hard stiff clay, stiff black cotton, hard red earth, shales, muram, gravel, stoney earth and earth mixed with small size boulders and hard gravelly soil depositing the earth on banks with initial lead of 10m , lowering the pipes into the trenches, aligning, refilling the trenches with excavated earth in layers of not more than 23 cm thick watering , ramming to consolidation , depositing the surplus earth,	10	m
5	Supplying and erection of of desilting pump (including Stsnd by)		

DETAILED ESTIMATE VALVE CHAMBER - 1.5 m x 3.4 m x 1.5 m								
SL. NO	DESCRIPTION OF WORK	NO	L (m)	B (m)	D (m)	QTY	TOTAL	
1	Earth work excavation	1	2.90	4.80	1.95	27.14	28.00	cu.m
2	Sand filling	1	2.90	4.80	0.15	2.09	3.00	cu.m
3	PCC 1:3:6, 40mm B.G with SRC	1	2.50	4.40	0.10	1.10	2.00	cu.m
4	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft							
	Raft	1	2.30	4.20	0.20	1.93		
	Walls	2	1.90	0.20	1.50	1.14		
		2	3.40	0.20	1.50	2.04		
						5.11	6.00	cu.m
5	Steel for RCC work	1	5.112 x 100 kg / cu.m			511.20	512.00	kg
6	Precast slab in Cement Concrete 1:2:4 using 12-20mm BG jelly for reinforced cement concrete works including cost of steel, centering, shuttering and cost of steel reinforcement and including laying in position, compacting, curing, finishing, etc., complete.	1	1.90	3.80	0.18	1.26	1.30	cu.m
7	Providing formwork							
	Raft	2	2.30		0.20	0.92		
		2		4.20	0.20	1.68		
	Walls outer	2	1.90		1.50	5.70		
		2		3.80	1.50	11.40		
	Walls inner	2	1.50		1.50	4.50		
		2		3.40	1.50	10.20		
					Total	34.40	35.00	sq.m
8	Refilling with excavated soil							
	Total Excavation	1				27.14		
	Deduction							
	PCC	1				1.10		
	Sand filling	1				2.09		
	RCC	1				5.11		
	Chamber Size	1	1.50	3.40	1.50	7.65		
						11.19	11.20	cu.m
9	Disposal of earth work							
	Excavation	1				27.14		
	Refilling	1				11.19		
						15.95	15.95	cu.m
10	S&F CI steps	1				5	5	Nos.

MEASUREMENT SHEET -RCC COLUMN & ISMB								
SR.NO	DESCRIPTION OF WORK	NO	LEN	WIDTH	DEPTH	QTY	TOTAL	
1	RCC work using Sulphate resistant cement concrete of M30 grade for RCC raft upto 1.5 m from G.L							
	above G.L for column	4.00	0.30	0.30	0.50	0.18	0.20	cu.m
	1.5m to 4.5m above G.L							
	above 1.5m from G.L for column	4.00	0.30	0.30	2.50	0.90	0.90	cu.m
2	Providing form work with centering for soffits of reinforced cement concrete slabs or plain surfaces including strutting upto 3m high.							
	upto 3.0m from G.L for column	16.00	0.30		2.00	9.60	9.60	sq.m
	above 3.0 m to 4.0 m	16.00	0.30		1.00	4.80	4.80	sq.m
3	Steel for RCC work	1.00	(1.08)x100 kg/ cu.m			108.00	108.00	kg
4	Plastering with CM 1:3,12mm thick							
	Side	16.00	0.30		3.00	14.40		
		4.00	0.30	0.30		0.36		
						14.76	15.00	sq.m
5	Colour washing two coats over one coat of white washing		same as plastering			14.76	15.00	sq.m
6	Supply and fixing ISMB 300mm of 42.2kg/m for 3.9m on column over screen/grit well	1.00	42.2kg/mx3.9mx1nos			164.58	170.00	kg
7	Supply and fixing ISMB 600mm of 122kg/m for 7.2m on column over suction well	1.00	122kg/mx7.2mx1nos			878.40	880.00	kg
8	Erecting with pulley block of 2T capacity	1.00				1.00	1.00	no
9	Erecting with pulley block of 1T capacity	1.00				1.00	1.00	no
10	Painting two coats with superior quality ready mixed paint	2.00	3.90		0.25	1.95		
		4.00	3.90	0.13		1.95		
		2.00	7.20		0.60	8.64		
		4.00	7.20	0.21		6.05		
						18.59	19.00	sq.m

ANNEXURE 6

DESIGN AND DRAWINGS

Consultant:



ANNEXURE 6
DESIGN AND DRAWINGS



Project:
IURWTS

Client:



ANNEXURE 6

DESIGN: SEWER NETWORK

Consultant:  anteagroup	ANNEXURE 6 DESIGN AND DRAWINGS : SEWER NETWORK	Project: IURWTS	Client: 
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SEWER NETWORK DESIGN -ELAMKULAM_ BLOCK 5

Sl. No.	Man Holes		Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		FLOWS LPS	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table		At Ultimate peak flow			Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To						Starting Manhole	Ending Manhole			Total Flow	ID				OD	Velocity (V)m/s	check (d/D<0.7)	Actual Velocity (v1) m/s		Check Velocity (> 0.3m/s)	From		To	Starting Manhole	
1	4	5	8	9	10.00	11	12	13	14	20	21	22	23	24	25	26	28	33	34	35	38	39	40	41	42	43	
1	JTA RD M59.4.2	JTA RD M59.4.3	H		26.00		26.00	2.774	2.655	0.083	11	200	203	DWC	218	180	1.01	OK	0.30	OK	1.67		1.53	1.10	1.13	OK	
2	JTA RD M59.4.3	JTA RD M59.4.4	C		15.00		41.00	2.655	2.5	0.130	13	200	203	DWC	97	120	1.24	OK	0.37	OK	1.53		1.40	1.13	1.10	OK	
3	JTA RD M59.4.4	JTA RD M59.4.5	C		30.00		71.00	2.5	2.284	0.226	17	200	203	DWC	139	139	1.15	OK	0.35	OK	1.40		1.18	1.10	1.10	OK	
4	JTA RD M59.4.5	JTA RD M59.4.6	C		17.00		88.00	2.284	2.344	0.280	19	200	203	DWC	-283	180	1.01	OK	0.30	OK	1.18		1.09	1.10	1.25	OK	
5	JTA RD M59.4.6	JTA RD M59.4.7	C		26.00		114.00	2.344	2.28	0.362	22	200	203	DWC	406	180	1.01	OK	0.30	OK	1.09		0.95	1.25	1.33	OK	
6	JTA RD M59.4.7	JTA RD M59.4.8	C		30.00		144.00	2.28	2.322	0.458	25	200	203	DWC	-714	180	1.01	OK	0.30	OK	0.95		0.78	1.33	1.54	OK	
7	JTA RD M59.4.8	JTA RD M59.4.9	C		30.00		174.00	2.322	2.457	0.553	27	200	203	DWC	-222	320	0.76	OK	0.30	OK	0.78		0.69	1.54	1.77	OK	
8	JTA RD M59.4.9	JTA RD M59.4.10	C		22.00		196.00	2.457	2.47	0.623	29	200	203	DWC	-1692	420	0.66	OK	0.30	OK	0.69		0.64	1.77	1.83	OK	
9	JTA RD M59.4.10	JTA RD M59.4.11	C		23.00		219.00	2.47	2.482	0.696	30	200	203	DWC	-1917	520	0.60	OK	0.30	OK	0.64		0.60	1.83	1.88	OK	
10	JTA RD M59.4.11	JTA RD M59.4.12	C		22.00		241.00	2.482	2.389	0.766	32	200	203	DWC	237	520	0.60	OK	0.30	OK	0.60		0.56	1.88	1.83	OK	
11	JTA RD M59.4.12	JTA RD M59.4.13	C		23.00		264.00	2.389	2.296	0.839	33	200	203	DWC	247	520	0.60	OK	0.30	OK	0.56		0.52	1.83	1.78	OK	
12	JTA RD M59.4.13	JTA RD M59.4.14	C		30.00		294.00	2.296	2.174	0.935	35	200	203	DWC	246	520	0.60	OK	0.32	OK	0.52		0.46	1.78	1.71	OK	
13	JTA RD M59.4.14	JTA RD M59.4.15	C		25.00		319.00	2.174	1.998	1.014	36	200	203	DWC	142	520	0.60	OK	0.32	OK	0.46		0.41	1.71	1.59	OK	
14	JTA RD M59.4.15	TBD RD M24	C		20.00		339.00	1.998	1.822	1.078	38	200	203	DWC	114	520	0.60	OK	0.33	OK	0.41		0.37	1.59	1.45	OK	
15	TBD RD M26	TBD RD M25	H		30.00		30.00	1.792	1.828	0.095	12	200	203	DWC	-833	180	1.01	OK	0.30	OK	0.69		0.52	1.10	1.31	OK	
16	TBD RD M25	TBD RD M24	C		30.00		60.00	1.828	1.822	0.191	16	200	203	DWC	5000	180	1.01	OK	0.30	OK	0.52		0.35	1.31	1.47	OK	
17	TBD RD M24	TBD RD M23	J		20.00		419.00	1.822	1.858	1.332	42	200	203	DWC	-556	520	0.60	OK	0.35	OK	0.35	0.35	0.31	1.47	1.55	OK	
18	TBD RD M23	TBD RD M22	C		30.00		449.00	1.858	1.856	1.427	43	200	203	DWC	15000	520	0.60	OK	0.36	OK	0.31		0.25	1.55	1.61	OK	
19	TBD RD M22	TBD RD M21	C		25.00		474.00	1.856	1.815	1.507	44	200	203	DWC	610	520	0.60	OK	0.36	OK	0.25		0.20	1.61	1.62	OK	
20	TBD RD M21	TBD RD M20	C		30.00		504.00	1.815	1.61	1.602	46	200	203	DWC	146	520	0.60	OK	0.37	OK	0.20		0.14	1.62	1.47	OK	
21	TBD RD M20.1	TBD RD M20	H		32.00		32.00	1.704	1.61	0.102	12	200	203	DWC	340	180	1.01	OK	0.30	OK	0.60		0.42	1.10	1.19	OK	
22	TBD RD M20	TBD RD M19	J		27.00		563.00	1.61	1.704	1.790	48	200	203	DWC	-287	520	0.60	OK	0.39	OK	0.14	0.14	0.09	1.47	1.61	OK	
23	TBD RD M19	TBD RD M18	C		16.00		579.00	1.704	1.72	1.841	49	200	203	DWC	-1000	520	0.60	OK	0.39	OK	0.09		0.06	1.61	1.66	OK	
24	TBD RD M18	TBD RD M17	C		26.00		605.00	1.72	1.756	1.923	50	200	203	DWC	-722	520	0.60	OK	0.39	OK	0.06		0.01	1.66	1.75	OK	
25	TBD RD M17.3	TBD RD M17.2	H		15.00		15.00	1.764	1.8	0.048	8	200	203	DWC	-417	180	1.01	OK	0.30	OK	0.66		0.58	1.10	1.22	OK	
26	TBD RD M17.2	TBD RD M17.1	C		17.00		32.00	1.8	1.795	0.102	12	200	203	DWC	3400	180	1.01	OK	0.30	OK	0.58		0.49	1.22	1.31	OK	
27	TBD RD M17.1	TBD RD M17	C		22.00		54.00	1.795	1.756	0.172	15	200	203	DWC	564	180	1.01	OK	0.30	OK	0.49		0.37	1.31	1.39	OK	
28	TBD RD M17	TBD RD M16	J		31.00		690.00	1.756	1.834	2.194	53	200	203	DWC	-397	520	0.60	OK	0.41	OK	0.01	0.01	-0.05	1.75	1.88	OK	
29	TBD RD M16	TBD RD M15	C		30.00		720.00	1.834	2.039	2.289	54	200	203	DWC	-146	520	0.60	OK	0.41	OK	-0.05		-0.11	1.88	2.15	OK	
30	TBD RD M15.5	TBD RD M15.4	H		11.00		11.00	1.794	1.697	0.035	7	200	203	DWC	113	112	1.28	OK	0.38	OK	0.69		0.59	1.10	1.11	OK	
31	TBD RD M15.4	TBD RD M15.3	C		23.00		34.00	1.697	1.686	0.108	12	200	203	DWC	2091	180	1.01	OK	0.30	OK	0.59		0.46	1.11	1.23	OK	
32	TBD RD M15.3.1	TBD RD M15.3	H		12.00		12.00	1.664	1.686	0.038	7	200	203	DWC	-545	180	1.01	OK	0.30	OK	0.56		0.49	1.10	1.20	OK	
33	TBD RD M15.3	TBD RD M15.2	J		20.00		66.00	1.686	1.711	0.210	17	200	203	DWC	-800	180	1.01	OK	0.30	OK	0.46	0.46	0.35	1.23	1.36	OK	
34	TBD RD M15.2	TBD RD M15.1	C		16.00		82.00	1.711	1.842	0.261	19	200	203	DWC	-122	180	1.01	OK	0.30	OK	0.35		0.26	1.36	1.58	OK	
35	TBD RD M15.1	TBD RD M15	C		19.00		101.00	1.842	2.039	0.321	21	200	203	DWC	-96	180	1.01	OK	0.30	OK	0.26		0.15	1.58	1.89	OK	
36	TBD RD M15	TBD RD M14	J		27.00		848.00	2.039	2.044	2.696	59	200	203	DWC	-5400	520	0.60	OK	0.42	OK	-0.11	-0.11	-0.16	2.15	2.20	OK	

Sl. No.	Man Holes		Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		FLOWS LPS	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table	At Ultimate peak flow		Check Velocity (> 0.3m/s)	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To						Velocity (V)m/s	check (d/D<0.7)			Actual Velocity (v1) m/s	From				To	Starting Manhole	Ending manhole							
63	TBD RD M3.2	TBD RD M3.1	C		21.00		116.00	2.124	2.233	0.369	22	200	203	DWC	-193	180	1.01	OK	0.30	OK	0.52		0.40	1.60	1.83	OK
64	TBD RD M3.1	TBD RD M3	C		30.00		146.00	2.233	2.252	0.464	25	200	203	DWC	-1579	180	1.01	OK	0.30	OK	0.40		0.23	1.83	2.02	OK
65	TBD RD M1	TBD RD M2	H		16.00	10082	10098.00	2.064	2.298	32.102	203	300	304	DWC	-68	870	0.60	OK	0.66	OK	0.86		0.84	1.20	1.46	OK
66	TBD RD M2	TBD RD M3	C		25.00		10123.00	2.298	2.252	32.181	203	300	304	DWC	543	870	0.60	OK	0.66	OK	0.84		0.81	1.46	1.44	OK
67	TBD RD M3	TBD RD M4	J		20.00		10289.00	2.252	2.264	32.709	205	300	304	DWC	-1667	870	0.60	OK	0.66	OK	0.23	0.23	0.21	2.02	2.05	OK
68	TBD RD M4.3	TBD RD M4.2	H		6.00		6.00	2.47	2.384	0.019	5	200	203	DWC	70	70	1.62	OK	0.49	OK	1.37		1.28	1.10	1.10	OK
69	TBD RD M4.2	TBD RD M4.1	C		27.00		33.00	2.384	2.439	0.105	12	200	203	DWC	-491	180	1.01	OK	0.30	OK	1.28		1.13	1.10	1.31	OK
70	TBD RD M4.1	TBD RD M4	C		26.00		59.00	2.439	2.264	0.188	16	200	203	DWC	149	180	1.01	OK	0.30	OK	1.13		0.99	1.31	1.27	OK
71	TBD RD M4	TBD RD M5	J		3.00		10351.00	2.264	2.264	32.906	205	300	304	DWC	0	870	0.60	OK	0.66	OK	0.21	0.21	0.21	2.05	2.05	OK
72	TBD RD M5.1	TBD RD M5	H		30.00		30.00	2.433	2.264	0.095	12	200	203	DWC	178	180	1.01	OK	0.30	OK	1.33		1.16	1.10	1.10	OK
73	TBD RD M5	TBD RD M6	J		11.00		10392.00	2.264	2.377	33.037	206	300	304	DWC	-97	870	0.60	OK	0.66	OK	0.21	0.21	0.20	2.05	2.18	OK
74	TBD RD M6	TBD RD M7	C		27.00		10419.00	2.377	2.358	33.122	206	300	304	DWC	1421	870	0.60	OK	0.66	OK	0.20		0.17	2.18	2.19	OK
75	TBD RD M7.1	TBD RD M7	H		32.00		32.00	2.524	2.358	0.102	12	200	203	DWC	193	180	1.01	OK	0.30	OK	1.42		1.24	1.10	1.12	OK
76	TBD RD M7	TBD RD M8	J		16.00		10467.00	2.358	2.264	33.275	206	300	304	DWC	170	870	0.60	OK	0.66	OK	0.17	0.17	0.15	2.19	2.11	OK
77	TBD RD M8	JTA RD M65	J		30.00		11739.00	2.264	2.341	37.319	219	342	400	HDPE	-390	1000	0.61	OK	0.66	OK	-0.41	-0.41	-0.44	2.67	2.78	OK
78	JTA RD M65	JTA RD M64	C		23.00		11762.00	2.341	2.44	37.392	219	342	400	HDPE	-232	1000	0.61	OK	0.66	OK	-0.44		-0.46	2.78	2.90	OK
79	JTA RD M64.3	JTA RD M64.2	H		11.00		11.00	2.644	2.632	0.035	7	200	203	DWC	917	180	1.01	OK	0.30	OK	1.54		1.48	1.10	1.15	OK
80	JTA RD M64.2	JTA RD M64.1	C		30.00		41.00	2.632	2.603	0.130	13	200	203	DWC	1034	180	1.01	OK	0.30	OK	1.48		1.31	1.15	1.29	OK
81	JTA RD M64.1	JTA RD M64	C		30.00		71.00	2.603	2.44	0.226	17	200	203	DWC	184	180	1.01	OK	0.30	OK	1.31		1.14	1.29	1.30	OK
82	JTA RD M64	JTA RD M63	J		22.00		11855.00	2.44	2.462	37.687	220	342	400	HDPE	-1000	1000	0.61	OK	0.66	OK	-0.46	-0.46	-0.48	2.90	2.94	OK
83	JTA RD M63.2	JTA RD M63.1	H		17.00		17.00	2.584	2.602	0.054	9	200	203	DWC	-944	180	1.01	OK	0.30	OK	1.48		1.39	1.10	1.21	OK
84	JTA RD M63.1	JTA RD M63	C		16.00		33.00	2.602	2.462	0.105	12	200	203	DWC	114	180	1.01	OK	0.30	OK	1.39		1.30	1.21	1.16	OK
85	JTA RD M63	JTA RD M62	J		27.00		11915.00	2.462	2.284	37.878	220	342	400	HDPE	152	1000	0.61	OK	0.66	OK	-0.48	-0.48	-0.51	2.94	2.79	OK
86	JTA RD M62.3	JTA RD M62.2	H		12.00		12.00	2.514	2.642	0.038	7	200	203	DWC	-94	180	1.01	OK	0.30	OK	1.41		1.34	1.10	1.30	OK
87	JTA RD M62.2	JTA RD M62.1	C		14.00		26.00	2.642	2.549	0.083	11	200	203	DWC	151	180	1.01	OK	0.30	OK	1.34		1.26	1.30	1.29	OK
88	JTA RD M62.1	JTA RD M62	C		17.00		43.00	2.549	2.284	0.137	14	200	203	DWC	64	180	1.01	OK	0.30	OK	1.26		1.17	1.29	1.11	OK
89	JTA RD M62	JTA RD M61	J		17.00		11975.00	2.284	2.225	38.069	221	342	400	HDPE	288	350	1.04	OK	0.98	OK	-0.51	-0.51	-0.56	2.79	2.79	OK
90	JTA RD M61	JTA RD M60	C		18.00		11993.00	2.225	2.166	38.126	221	342	400	HDPE	305	305	1.11	OK	1.03	OK	-0.56		-0.62	2.79	2.79	OK
91	JTA RD M60.3	JTA RD M60.2	H		16.00		16.00	2.174	2.483	0.051	9	200	203	DWC	-52	180	1.01	OK	0.30	OK	1.07		0.98	1.10	1.50	OK
92	JTA RD M60.2	JTA RD M60.1	C		23.00		39.00	2.483	2.223	0.124	13	200	203	DWC	88	180	1.01	OK	0.30	OK	0.98		0.85	1.50	1.37	OK
93	JTA RD M60.1	JTA RD M60	C		4.00		43.00	2.223	2.166	0.137	14	200	203	DWC	70	180	1.01	OK	0.30	OK	0.85		0.83	1.37	1.34	OK
94	JTA RD M60	JTA RD M59	J		32.00		12068.00	2.166	2.142	38.365	222	342	400	HDPE	1333	1000	0.61	OK	0.66	OK	-0.62	-0.62	-0.65	2.79	2.79	OK
95	JTA RD M59.13	JTA RD M59.12	H		29.00		29.00	2.52	2.6	0.092	11	200	203	DWC	-363	180	1.01	OK	0.30	OK	1.42		1.26	1.10	1.34	OK
96	JTA RD M59.12	JTA RD M59.11	C		21.00		50.00	2.6	2.603	0.159	15	200	203	DWC	-7000	180	1.01	OK	0.30	OK	1.26		1.14	1.34	1.46	OK
97	JTA RD M59.11	JTA RD M59.10	C		12.00		62.00	2.603	2.6	0.197	16	200	203	DWC	4000	180	1.01	OK	0.30	OK	1.14		1.07	1.46	1.53	OK
98	JTA RD M59.10	JTA RD M59.9	C		32.00		94.00	2.6	2.259	0.299	20	200	203	DWC	94	180	1.01	OK	0.30	OK	1.07		0.89	1.53	1.37	OK
99	JTA RD M59.9.2	JTA RD M59.9.1	H		26.00		26.00	1.994	2.188	0.083</																

Sl. No.	Man Holes		Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		FLOWS LPS	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table	At Ultimate peak flow		Check Velocity (> 0.3m/s)	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To						Velocity (V)m/s	check (d/D<0.7)			Actual Velocity (v1) m/s	From				To	Starting Manhole	Ending manhole							
129	JTA RD M52	JTA RD M51	J		2.00		12868.00	2.162	2.028	40.908	229	342	400	HDPE	15	1000	0.61	OK	0.67	OK	-0.83	-0.83	-0.83	2.99	2.86	OK
130	JTA RD M51.5	JTA RD M51.4	H		17.00		17.00	1.934	1.976	0.054	9	200	203	DWC	-405	180	1.01	OK	0.30	OK	0.83		0.74	1.10	1.24	OK
131	JTA RD M51.4	JTA RD M51.3	C		19.00		36.00	1.976	2.002	0.114	13	200	203	DWC	-731	180	1.01	OK	0.30	OK	0.74		0.63	1.24	1.37	OK
132	JTA RD M51.3	JTA RD M51.2	C		18.00		54.00	2.002	1.948	0.172	15	200	203	DWC	333	180	1.01	OK	0.30	OK	0.63		0.53	1.37	1.42	OK
133	JTA RD M51.2	JTA RD M51.1	C		16.00		70.00	1.948	1.911	0.223	17	200	203	DWC	432	180	1.01	OK	0.30	OK	0.53		0.44	1.42	1.47	OK
134	JTA RD M51.1	JTA RD M51	C		30.00		100.00	1.911	2.028	0.318	21	200	203	DWC	-256	180	1.01	OK	0.30	OK	0.44		0.27	1.47	1.76	OK
135	JTA RD M51	JTA RD M50	J		32.00		13000.00	2.028	2.028	41.327	230	342	400	HDPE	0	1000	0.61	OK	0.67	OK	-0.83	-0.83	-0.86	2.86	2.89	OK
136	JTA RD M50.4	JTA RD M50.3	H		16.00		16.00	2.08	2.175	0.051	9	200	203	DWC	-168	180	1.01	OK	0.30	OK	0.98		0.89	1.10	1.29	OK
137	JTA RD M50.3	JTA RD M50.2	C		20.00		36.00	2.175	2.132	0.114	13	200	203	DWC	465	180	1.01	OK	0.30	OK	0.89		0.78	1.29	1.35	OK
138	JTA RD M50.2	JTA RD M50.1	C		29.00		65.00	2.132	2.013	0.207	17	200	203	DWC	244	180	1.01	OK	0.30	OK	0.78		0.62	1.35	1.39	OK
139	JTA RD M50.1	JTA RD M50	C		12.00		77.00	2.013	2.028	0.245	18	200	203	DWC	-800	180	1.01	OK	0.30	OK	0.62		0.55	1.39	1.48	OK
140	JTA RD M50	JTA RD M49	J		5.00		13082.00	2.028	1.962	41.588	231	342	400	HDPE	76	1000	0.61	OK	0.67	OK	-0.86	-0.86	-0.87	2.89	2.83	OK
141	L38 RD M6	L38 RD M5	H		21.00		21.00	2.004	2.126	0.067	10	200	203	DWC	-172	180	1.01	OK	0.30	OK	0.90		0.78	1.10	1.35	OK
142	L38 RD M5	L38 RD M4	C		10.00		31.00	2.126	2.15	0.099	12	200	203	DWC	-417	180	1.01	OK	0.30	OK	0.78		0.72	1.35	1.43	OK
143	L38 RD M4	L38 RD M3	C		23.00		54.00	2.15	2.252	0.172	15	200	203	DWC	-225	180	1.01	OK	0.30	OK	0.72		0.59	1.43	1.66	OK
144	L38 RD M3	L38 RD M2	C		12.00		66.00	2.252	2.209	0.210	17	200	203	DWC	279	180	1.01	OK	0.30	OK	0.59		0.52	1.66	1.69	OK
145	L38 RD M2	L38 RD M1	C		30.00		96.00	2.209	2.134	0.305	20	200	203	DWC	400	180	1.01	OK	0.30	OK	0.52		0.35	1.69	1.78	OK
146	L38 RD M1	JTA RD M49	C		25.00		121.00	2.134	1.962	0.385	23	200	203	DWC	145	180	1.01	OK	0.30	OK	0.35		0.21	1.78	1.75	OK
147	JTA RD M49	JTA RD M48	J		27.00		13230.00	1.962	2.023	42.059	232	342	400	HDPE	-443	1000	0.61	OK	0.67	OK	-0.87	-0.87	-0.90	2.83	2.92	OK
148	JTA RD M48	JTA RD M47	C		16.00		13246.00	2.023	1.885	42.110	232	342	400	HDPE	116	1000	0.61	OK	0.68	OK	-0.90		-0.92	2.92	2.81	OK
149	JTA RD M47.8	JTA RD M47.7	H		7.00		7.00	2.243	2.228	0.022	6	200	203	DWC	467	180	1.01	OK	0.30	OK	1.14		1.10	1.10	1.13	OK
150	JTA RD M47.7	JTA RD M47.6	C		12.00		19.00	2.228	2.202	0.060	9	200	203	DWC	462	180	1.01	OK	0.30	OK	1.10		1.03	1.13	1.17	OK
151	JTA RD M47.6	JTA RD M47.5	C		3.00		22.00	2.202	2.202	0.070	10	200	203	DWC	0	180	1.01	OK	0.30	OK	1.03		1.01	1.17	1.19	OK
152	JTA RD M47.5	JTA RD M47.4	C		12.00		34.00	2.202	2.13	0.108	12	200	203	DWC	167	180	1.01	OK	0.30	OK	1.01		0.94	1.19	1.19	OK
153	JTA RD M47.4	JTA RD M47.3	C		12.00		46.00	2.13	2.128	0.146	14	200	203	DWC	6000	180	1.01	OK	0.30	OK	0.94		0.87	1.19	1.26	OK
154	JTA RD M47.3	JTA RD M47.2	C		11.00		57.00	2.128	2.107	0.181	16	200	203	DWC	524	180	1.01	OK	0.30	OK	0.87		0.81	1.26	1.30	OK
155	JTA RD M47.2	JTA RD M47.1	C		13.00		70.00	2.107	2.003	0.223	17	200	203	DWC	125	180	1.01	OK	0.30	OK	0.81		0.74	1.30	1.26	OK
156	JTA RD M47.1	JTA RD M47	C		21.00		91.00	2.003	1.885	0.289	20	200	203	DWC	178	180	1.01	OK	0.30	OK	0.74		0.62	1.26	1.27	OK
157	JTA RD M47	JTA RD M46	J		19.00		13356.00	1.885	1.885	42.459	233	342	400	HDPE	0	1000	0.61	OK	0.68	OK	-0.92	-0.92	-0.94	2.81	2.83	OK
158	JTA RD M46.4	JTA RD M46.3	H		24.00		24.00	1.974	1.936	0.076	10	200	203	DWC	632	180	1.01	OK	0.30	OK	0.87		0.74	1.10	1.20	OK
159	JTA RD M46.3	JTA RD M46.2	C		30.00		54.00	1.936	1.789	0.172	15	200	203	DWC	204	180	1.01	OK	0.30	OK	0.74		0.57	1.20	1.22	OK
160	JTA RD M46.2	JTA RD M46.1	C		22.00		76.00	1.789	1.822	0.242	18	200	203	DWC	-667	180	1.01	OK	0.30	OK	0.57		0.45	1.22	1.37	OK
161	JTA RD M46.1	JTA RD M46	C		19.00		95.00	1.822	1.885	0.302	20	200	203	DWC	-302	180	1.01	OK	0.30	OK	0.45		0.34	1.37	1.55	OK
162	JTA RD M46	JTA RD M45	J		28.00		13479.00	1.885	1.966	42.850	234	342	400	HDPE	-346	1000	0.61	OK	0.68	OK	-0.94	-0.94	-0.97	2.83	2.94	OK
163	L35 RD M6	L35 RD M5	H		15.00		15.00	1.954	1.882	0.048	8	200	203	DWC	208	180	1.01	OK	0.30	OK	0.85		0.77	1.10	1.11	OK
164	L35 RD M5	L35 RD M4	C		20.00		35.00	1.882	1.934	0.111	12	200	203	DWC	-385	180	1.01	OK	0.30	OK	0.77		0.66	1.11	1.27	OK
165	L35 RD M4	L35 RD M3	C		19.00		54.00	1.9																		

Sl. No.	Man Holes		Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		FLOWS LPS	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table	At Ultimate peak flow		Check Velocity (> 0.3m/s)	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To						Starting Manhole	Ending Manhole			Total Flow	ID				OD	Velocity (V)m/s	check (d/D<0.7)		Actual Velocity (v1) m/s	From		To	Starting Manhole	
195	JTA RD M35	JTA RD M34	J		23.00		14156.00	2.192	2.194	45.002	240	342	400	HDPE	-11500	1000	0.61	OK	0.68	OK	-1.19	-1.19	-1.21	3.38	3.40	OK
196	JTA RD M34	JTA RD M33	C		25.00		14181.00	2.194	2.207	45.082	240	342	400	HDPE	-1923	1000	0.61	OK	0.68	OK	-1.21		-1.24	3.40	3.45	OK
197	JTA RD M33	JTA RD M32	C		10.00		14191.00	2.207	2.092	45.114	240	342	400	HDPE	87	1000	0.61	OK	0.68	OK	-1.24		-1.25	3.45	3.34	OK
198	JTA RD M32	JTA RD M31	C		17.00		14208.00	2.092	2.152	45.168	240	342	400	HDPE	-283	1000	0.61	OK	0.68	OK	-1.25		-1.27	3.34	3.42	OK
199	SJC RD M2	SJC RD M1	H		30.00		30.00	2.12	2.138	0.095	12	200	203	DWC	-1667	180	1.01	OK	0.30	OK	1.02		0.85	1.10	1.29	OK
200	SJC RD M1	JTA RD M31	C		23.00		53.00	2.138	2.152	0.168	15	200	203	DWC	-1643	180	1.01	OK	0.30	OK	0.85		0.72	1.29	1.43	OK
201	JTA RD M31	JTA RD M30	J		11.00		14272.00	2.152	2.001	45.371	241	342	400	HDPE	73	1000	0.61	OK	0.68	OK	-1.27	-1.27	-1.28	3.42	3.28	OK
202	PD RD M8	PD RD M7	H		15.00		15.00	2.054	2.077	0.048	8	200	203	DWC	-652	180	1.01	OK	0.30	OK	0.95		0.87	1.10	1.21	OK
203	PD RD M7.1	PD RD M7	H		19.00		19.00	2.032	2.077	0.060	9	200	203	DWC	-422	180	1.01	OK	0.30	OK	0.93		0.82	1.10	1.26	OK
204	PD RD M7	PD RD M6	J		14.00		48.00	2.077	2.057	0.153	14	200	203	DWC	700	180	1.01	OK	0.30	OK	0.82	0.82	0.74	1.26	1.32	OK
205	PD RD M6	PD RD M5	C		16.00		64.00	2.057	2.074	0.203	17	200	203	DWC	-941	180	1.01	OK	0.30	OK	0.74		0.65	1.32	1.42	OK
206	PD RD M5.2	PD RD M5.1	H		30.00		30.00	2.074	2.044	0.095	12	200	203	DWC	1000	180	1.01	OK	0.30	OK	0.97		0.80	1.10	1.24	OK
207	PD RD M5.1	PD RD M5	C		17.00		47.00	2.044	2.074	0.149	14	200	203	DWC	-567	180	1.01	OK	0.30	OK	0.80		0.71	1.24	1.36	OK
208	PD RD M5	PD RD M4	J		7.00		118.00	2.074	2.069	0.375	22	200	203	DWC	1400	180	1.01	OK	0.30	OK	0.65	0.65	0.61	1.42	1.46	OK
209	PD RD M4	PD RD M3	C		24.00		142.00	2.069	2.134	0.451	24	200	203	DWC	-369	320	0.76	OK	0.30	OK	0.61		0.53	1.46	1.60	OK
210	PD RD M1	PD RD M2	H		20.00		20.00	2.134	2.139	0.064	9	200	203	DWC	-4000	180	1.01	OK	0.30	OK	1.03		0.92	1.10	1.22	OK
211	PD RD M2	PD RD M3	C		15.00		35.00	2.139	2.134	0.111	12	200	203	DWC	3000	180	1.01	OK	0.30	OK	0.92		0.84	1.22	1.29	OK
212	PD RD M3	JTA RD M30.8	J		24.00		201.00	2.134	2.172	0.639	29	200	203	DWC	-632	420	0.66	OK	0.30	OK	0.53	0.53	0.47	1.60	1.70	OK
213	JTA RD M30.8	JTA RD M30.7	C		15.00		216.00	2.172	2.145	0.687	30	200	203	DWC	556	420	0.66	OK	0.30	OK	0.47		0.43	1.70	1.72	OK
214	JTA RD M30.7	JTA RD M30.6	C		25.00		241.00	2.145	2.178	0.766	32	200	203	DWC	-758	520	0.60	OK	0.30	OK	0.43		0.38	1.72	1.80	OK
215	JTA RD M30.6	JTA RD M30.5	C		31.00		272.00	2.178	2.196	0.865	34	200	203	DWC	-1722	520	0.60	OK	0.32	OK	0.38		0.32	1.80	1.88	OK
216	JTA RD M30.5	JTA RD M30.4	C		23.00		295.00	2.196	2.257	0.938	35	200	203	DWC	-377	520	0.60	OK	0.32	OK	0.32		0.28	1.88	1.98	OK
217	JTA RD M30.4.3	JTA RD M30.4.2	H		22.00		22.00	2.414	2.393	0.070	10	200	203	DWC	1048	180	1.01	OK	0.30	OK	1.31		1.19	1.10	1.20	OK
218	JTA RD M30.4.2	JTA RD M30.4.1	C		20.00		42.00	2.393	2.343	0.134	14	200	203	DWC	400	180	1.01	OK	0.30	OK	1.19		1.08	1.20	1.26	OK
219	JTA RD M30.4.1	JTA RD M30.4	C		11.00		53.00	2.343	2.257	0.168	15	200	203	DWC	128	180	1.01	OK	0.30	OK	1.08		1.02	1.26	1.24	OK
220	JTA RD M30.4	JTA RD M30.3	J		4.00		352.00	2.257	2.272	1.119	38	200	203	DWC	-267	520	0.60	OK	0.33	OK	0.28	0.28	0.27	1.98	2.00	OK
221	JTA RD M30.3.1	JTA RD M30.3	H		28.00		28.00	2.644	2.272	0.089	11	200	203	DWC	75	75	1.57	OK	0.47	OK	1.54		1.17	1.10	1.10	OK
222	JTA RD M30.3	JTA RD M30.2	J		14.00		394.00	2.272	2.265	1.253	40	200	203	DWC	2000	520	0.60	OK	0.35	OK	0.27	0.27	0.24	2.00	2.03	OK
223	JTA RD M30.2	JTA RD M30.1	C		26.00		420.00	2.265	2.269	1.335	42	200	203	DWC	-6500	520	0.60	OK	0.35	OK	0.24		0.19	2.03	2.08	OK
224	JTA RD M30.1	JTA RD M30	C		18.00		438.00	2.269	2.001	1.392	43	200	203	DWC	67	520	0.60	OK	0.35	OK	0.19		0.16	2.08	1.84	OK
225	JTA RD M30	JTA RD M29	J		26.00		14736.00	2.001	2.04	46.846	245	342	400	HDPE	-667	1000	0.61	OK	0.69	OK	-1.28	-1.28	-1.31	3.28	3.35	OK
226	JTA RD M29.4	JTA RD M29.3	H		4.00		4.00	2.484	2.446	0.013	5	200	203	DWC	105	110	1.29	OK	0.39	OK	1.38		1.34	1.10	1.11	OK
227	JTA RD M29.3	JTA RD M29.2	C		7.00		11.00	2.446	2.373	0.035	7	200	203	DWC	96	100	1.36	OK	0.41	OK	1.34		1.27	1.11	1.10	OK
228	JTA RD M29.2	JTA RD M29.1	C		22.00		33.00	2.373	2.348	0.105	12	200	203	DWC	880	180	1.01	OK	0.30	OK	1.27		1.15	1.10	1.20	OK
229	JTA RD M29.1	JTA RD M29	C		25.00		58.00	2.348	2.04	0.184	16	200	203	DWC	81	120	1.24	OK	0.37	OK	1.15		0.94	1.20	1.10	OK
230	JTA RD M29	JTA RD M28	J		31.00		14825.00	2.04	2.153	47.129	246	342	400	HDPE	-274	1000	0.61	OK	0.69	OK	-1.31	-1.31	-1.34	3.35	3.49	OK
231																										

Sl. No.	Man Holes		Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		FLOWS LPS	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table	At Ultimate peak flow		Check Velocity (> 0.3m/s)	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To						Starting Manhole	Ending Manhole			Total Flow	ID				OD	Velocity (V)m/s	check (d/D<0.7)		Actual Velocity (v1) m/s	From	To	Starting Manhole	Ending manhole	
261	JTA RD M20	JTA RD M21	J		31.00		575.00	2.694	2.29	1.828	49	200	203	DWC	77	520	0.60	OK	0.39	OK	0.86	0.86	0.80	1.83	1.49	OK
262	JRA RD M5	JRA RD M4	H		19.00	6148	6167.00	2.454	2.397	19.605	159	250	253	DWC	333	333	0.86	OK	0.85	OK	1.30		1.24	1.15	1.16	OK
263	JRA RD M4	JRA RD M3	C		20.00		6187.00	2.397	2.394	19.669	159	250	253	DWC	6667	700	0.60	OK	0.64	OK	1.24		1.21	1.16	1.18	OK
264	JRA RD M3	JRA RD M2	C		30.00		6217.00	2.394	2.391	19.764	159	250	253	DWC	10000	700	0.60	OK	0.64	OK	1.21		1.17	1.18	1.22	OK
265	JRA RD M2.2	JRA RD M2.1	H		20.00		20.00	2.481	2.436	0.064	9	200	203	DWC	444	180	1.01	OK	0.30	OK	1.38		1.27	1.10	1.17	OK
266	JRA RD M2.1	JRA RD M2	C		20.00		40.00	2.436	2.391	0.127	13	200	203	DWC	444	180	1.01	OK	0.30	OK	1.27		1.16	1.17	1.23	OK
267	JRA RD M2	JRA RD M1	J		17.00		6274.00	2.391	2.37	19.945	160	250	253	DWC	810	700	0.60	OK	0.64	OK	1.16	1.16	1.14	1.23	1.23	OK
268	JRA RD M1	JTA RD M21	C		30.00		6304.00	2.37	2.29	20.041	160	250	253	DWC	375	700	0.60	OK	0.64	OK	1.14		1.10	1.23	1.19	OK
269	JTA RD M21	JTA RD M22	J		25.00		6904.00	2.29	2.209	21.948	168	250	253	DWC	309	700	0.60	OK	0.65	OK	0.80	0.80	0.76	1.49	1.45	OK
270	JTA RD M22	JTA RD M23	C		30.00		6934.00	2.209	2.101	22.043	168	250	253	DWC	450	700	0.60	OK	0.65	OK	0.76		0.72	1.45	1.38	OK
271	JTA RD M23	JTA RD M24	C		23.00		6957.00	2.101	2.124	22.117	168	250	253	DWC	-1000	700	0.60	OK	0.65	OK	0.72		0.69	1.38	1.43	OK
272	JTA RD M24.2	JTA RD M24.1	H		31.00		31.00	2.124	2.124	0.099	12	200	203	DWC	0	180	1.01	OK	0.30	OK	1.02		0.85	1.10	1.27	OK
273	JTA RD M24.1	JTA RD M24	C		31.00		62.00	2.124	2.124	0.197	16	200	203	DWC	0	180	1.01	OK	0.30	OK	0.85		0.68	1.27	1.44	OK
274	JTA RD M24	JTA RD M25	J		14.00		7033.00	2.124	2.248	22.358	169	250	253	DWC	-113	700	0.60	OK	0.65	OK	0.68	0.68	0.66	1.44	1.59	OK
275	JTA RD M25.6	JTA RD M25.5	H		18.00		18.00	2.914	2.964	0.057	9	200	203	DWC	-360	180	1.01	OK	0.30	OK	1.81		1.71	1.10	1.25	OK
276	JTA RD M25.5	JTA RD M25.4	C		30.00		48.00	2.964	2.932	0.153	14	200	203	DWC	937	180	1.01	OK	0.30	OK	1.71		1.54	1.25	1.39	OK
277	JTA RD M25.4	JTA RD M25.3	C		30.00		78.00	2.932	2.967	0.248	18	200	203	DWC	-857	180	1.01	OK	0.30	OK	1.54		1.37	1.39	1.60	OK
278	JTA RD M25.3	JTA RD M25.2	C		25.00		103.00	2.967	2.818	0.327	21	200	203	DWC	168	180	1.01	OK	0.30	OK	1.37		1.23	1.60	1.59	OK
279	JTA RD M25.2	JTA RD M25.1	C		10.00		113.00	2.814	2.718	0.359	22	200	203	DWC	104	180	1.01	OK	0.30	OK	1.23		1.17	1.58	1.55	OK
280	JTA RD M25.1	JTA RD M25	C		30.00		143.00	2.718	2.248	0.455	25	200	203	DWC	64	180	1.01	OK	0.30	OK	1.17		1.00	1.55	1.25	OK
281	JTA RD M25	JTA RD M26	J		20.00		7196.00	2.248	2.137	22.876	171	250	253	DWC	180	700	0.60	OK	0.65	OK	0.66	0.66	0.63	1.59	1.51	OK
282	JTA RD M26	JTA RD M27	C		23.00		7219.00	2.137	2.136	22.949	171	250	253	DWC	23000	700	0.60	OK	0.65	OK	0.63		0.60	1.51	1.54	OK
283	JTA RD M27	JTA RD M27.1	J		5.00		22134.00	2.136	2.331	70.365	300	427	500	HDPE	-26	1000	0.71	OK	0.77	OK	-1.35	-1.35	-1.36	3.49	3.69	OK
284	JTA RD M27.1	JTA RD M27.2	C		30.00		22164.00	2.331	2.435	70.460	300	427	500	HDPE	-288	1000	0.71	OK	0.77	OK	-1.36		-1.39	3.69	3.83	OK
285	JTA RD M27.2	JTA RD M27.3	C		30.00		22194.00	2.435	2.37	70.556	300	427	500	HDPE	462	1000	0.71	OK	0.77	OK	-1.39		-1.42	3.83	3.79	OK
286	JTA RD M27.3	TOH RD M27.4	C		25.00		22219.00	2.37	2.336	70.635	300	427	500	HDPE	735	1000	0.71	OK	0.77	OK	-1.42		-1.45	3.79	3.79	OK
287	TOH RD M27.7	TOH RD M27.6	H		22.00		22.00	2.184	2.157	0.070	10	200	203	DWC	815	180	1.01	OK	0.30	OK	1.08		0.96	1.10	1.20	OK
288	TOH RD M27.6	TOH RD M27.5	C		30.00		52.00	2.157	2.29	0.165	15	200	203	DWC	-226	180	1.01	OK	0.30	OK	0.96		0.79	1.20	1.50	OK
289	TOH RD M27.5	TOH RD M27.4	C		6.00		58.00	2.29	2.336	0.184	16	200	203	DWC	-130	180	1.01	OK	0.30	OK	0.79		0.76	1.50	1.58	OK
290	TOH RD M27.4	TOH RD M27.3	J		7.00		22284.00	2.336	2.307	70.842	301	427	500	HDPE	241	1000	0.71	OK	0.77	OK	-1.45	-1.45	-1.46	3.79	3.77	OK
291	TOH RD M27.3	TOH RD M27.2	C		16.00		22300.00	2.307	2.178	70.893	301	427	500	HDPE	124	1000	0.71	OK	0.77	OK	-1.46		-1.48	3.77	3.66	OK
292	TOH RD M27.2	TOH RD M27.1	C		30.00		22330.00	2.178	2.064	70.988	301	427	500	HDPE	263	1000	0.71	OK	0.77	OK	-1.48		-1.51	3.66	3.57	OK
293	TOH RD M27.1	TOH RD M27	C		23.00		22353.00	2.064	2.073	71.061	301	427	500	HDPE	-2556	1000	0.71	OK	0.77	OK	-1.51		-1.53	3.57	3.60	OK
294	TOH RD M45	TOH RD M44	H		30.00		30.00	2.264	2.06	0.095	12	200	203	DWC	147	147	1.12	OK	0.34	OK	1.16		0.96	1.10	1.10	OK
295	TOH RD M44	TOH RD M43	C		13.00		43.00	2.06	2.056	0.137	14	200	203	DWC	3250	180	1.01	OK	0.30	OK	0.96		0.89	1.10	1.17	OK
296	TOH RD M43.2	TOH RD M43.1	H		30.00		30.00	1.974	2.016	0.095	12	200	203	DWC	-714	180	1.01	OK	0.30	OK						

Sl. No.	Man Holes		Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		FLOWS LPS	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table	At Ultimate peak flow			Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To						Starting Manhole	Ending Manhole			Total Flow	ID				OD	Velocity (V)m/s	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)	From	To	Starting Manhole	Ending manhole	
327	TOH RD M33.1	TOH RD M33	H		27.00		27.00	2.263	2.142	0.086	11	200	203	DWC	223	180	1.01	OK	0.30	OK	1.16		1.01	1.10	1.13	OK
328	TOH RD M33	TOH RD M32	J		16.00		792.00	2.142	2.067	2.518	57	200	203	DWC	213	520	0.60	OK	0.42	OK	-0.16	-0.16	-0.19	2.30	2.26	OK
329	TOH RD M32.2	TOH RD M32.1	H		14.00		14.00	2.121	2.015	0.045	8	200	203	DWC	132	132	1.18	OK	0.35	OK	1.02		0.91	1.10	1.11	OK
330	TOH RD M32.1	TOH RD M32	C		8.00		22.00	2.015	2.064	0.070	10	200	203	DWC	-163	180	1.01	OK	0.30	OK	0.91		0.87	1.11	1.19	OK
331	PTA RD M1	TOH RD M32	H		25.00		25.00	1.88	2.064	0.079	11	200	203	DWC	-136	180	1.01	OK	0.30	OK	0.78		0.64	1.10	1.42	OK
332	TOH RD M32	TOH RD M31	J		15.00		854.00	2.064	2.088	2.715	59	200	203	DWC	-625	520	0.60	OK	0.42	OK	-0.19	-0.19	-0.22	2.25	2.31	OK
333	TOH RD M31	TOH RD M30	C		30.00		884.00	2.088	2.12	2.810	60	200	203	DWC	-937	520	0.60	OK	0.43	OK	-0.22		-0.28	2.31	2.40	OK
334	TOH RD M30	TOH RD M29	C		20.00		904.00	2.12	2.13	2.874	61	200	203	DWC	-2000	520	0.60	OK	0.43	OK	-0.28		-0.32	2.40	2.45	OK
335	TOH RD M29	TOH RD M28	C		30.00		934.00	2.13	2.028	2.969	62	200	203	DWC	294	520	0.60	OK	0.44	OK	-0.32		-0.38	2.45	2.41	OK
336	TOH RD M28	TOH RD M27	C		8.00		942.00	2.028	2.073	2.995	62	200	203	DWC	-178	520	0.60	OK	0.44	OK	-0.38		-0.40	2.41	2.47	OK
337	LN16 RD M3	LN16 RD M2	H		15.00		15.00	1.804	1.855	0.048	8	200	203	DWC	-294	180	1.01	OK	0.30	OK	0.70		0.62	1.10	1.24	OK
338	LN16 RD M2	LN16 RD M1	C		30.00		45.00	1.855	1.956	0.143	14	200	203	DWC	-297	180	1.01	OK	0.30	OK	0.62		0.45	1.24	1.51	OK
339	LN16 RD M1	TOH RD M27	C		30.00		75.00	1.956	2.073	0.238	18	200	203	DWC	-256	180	1.01	OK	0.30	OK	0.45		0.28	1.51	1.79	OK
340	TOH RD M27	TOH RD M26	J		30.00		23400.00	2.073	1.785	74.389	308	427	500	HDPE	104	1000	0.71	OK	0.78	OK	-1.53	-1.53	-1.56	3.60	3.35	OK
341	TOH RD M26	TOH RD M25	C		7.00		23407.00	1.785	1.844	74.412	308	427	500	HDPE	-119	1000	0.71	OK	0.78	OK	-1.56		-1.57	3.35	3.41	OK
342	TOH RD M25.1	TOH RD M25	H		25.00		25.00	2.261	1.844	0.079	11	200	203	DWC	60	60	1.75	OK	0.53	OK	1.16		0.74	1.10	1.10	OK
343	TOH RD M25.3	TOH RD M25.2	H		22.00		22.00	2.243	2.06	0.070	10	200	203	DWC	120	120	1.24	OK	0.37	OK	1.14		0.96	1.10	1.10	OK
344	TOH RD M25.2	TOH RD M25	C		30.00		52.00	2.06	1.844	0.165	15	200	203	DWC	139	139	1.15	OK	0.35	OK	0.96		0.74	1.10	1.10	OK
345	TOH RD M25	TOH RD M24	J		4.00		23488.00	1.844	1.841	74.669	309	427	500	HDPE	1333	1000	0.71	OK	0.78	OK	-1.57	-1.57	-1.57	3.41	3.41	OK
346	TOH RD M24	TOH RD M23	C		30.00		23518.00	1.841	1.945	74.765	309	427	500	HDPE	-288	1000	0.71	OK	0.78	OK	-1.57		-1.60	3.41	3.55	OK
347	TOH RD M23	TOH RD M22	C		20.00		23538.00	1.945	1.939	74.828	309	427	500	HDPE	3333	1000	0.71	OK	0.78	OK	-1.60		-1.62	3.55	3.56	OK
348	TOH RD M22.1	TOH RD M22	H		32.00		32.00	1.971	1.939	0.102	12	200	203	DWC	1000	180	1.01	OK	0.30	OK	0.87		0.69	1.10	1.25	OK
349	TOH RD M22	TOH RD M21	J		22.00		23592.00	1.939	1.914	75.000	310	427	500	HDPE	880	1000	0.71	OK	0.78	OK	-1.62	-1.62	-1.64	3.56	3.55	OK
350	TOH RD M21.2	TOH RD M21.1	H		30.00		30.00	1.823	1.867	0.095	12	200	203	DWC	-682	180	1.01	OK	0.30	OK	0.72		0.55	1.10	1.32	OK
351	TOH RD M21.1	TOH RD M21	C		30.00		60.00	1.867	1.914	0.191	16	200	203	DWC	-638	180	1.01	OK	0.30	OK	0.55		0.38	1.32	1.53	OK
352	TOH RD M21	TOH RD M20	J		6.00		23658.00	1.914	1.954	75.210	310	427	500	HDPE	-150	1000	0.71	OK	0.78	OK	-1.64	-1.64	-1.65	3.55	3.60	OK
353	TOH RD M20.3	TOH RD M20.2	H		17.00		17.00	2.184	2.065	0.054	9	200	203	DWC	143	145	1.13	OK	0.34	OK	1.08		0.96	1.10	1.11	OK
354	TOH RD M20.2	TOH RD M20.1	C		23.00		40.00	2.065	1.974	0.127	13	200	203	DWC	253	180	1.01	OK	0.30	OK	0.96		0.83	1.11	1.14	OK
355	TOH RD M20.1	TOH RD M20	C		27.00		67.00	1.974	1.954	0.213	17	200	203	DWC	1350	180	1.01	OK	0.30	OK	0.83		0.68	1.14	1.27	OK
356	TOH RD M20	TOH RD M19	J		26.00		23751.00	1.954	1.944	75.505	311	427	500	HDPE	2600	1000	0.71	OK	0.78	OK	-1.65	-1.65	-1.68	3.60	3.62	OK
357	LN11 RD M4	LN11 RD M3	H		11.00		11.00	2.384	2.287	0.035	7	200	203	DWC	113	113	1.28	OK	0.38	OK	1.28		1.18	1.10	1.11	OK
358	LN11 RD M3	LN11 RD M2	C		15.00		26.00	2.287	2.195	0.083	11	200	203	DWC	163	175	1.03	OK	0.31	OK	1.18		1.09	1.11	1.11	OK
359	LN11 RD M2	LN11 RD M1	C		12.00		38.00	2.195	2.055	0.121	13	200	203	DWC	86	86	1.46	OK	0.44	OK	1.09		0.95	1.11	1.11	OK
360	LN11 RD M1	TOH RD M19	C		25.00		63.00	2.055	1.944	0.200	16	200	203	DWC	225	180	1.01	OK	0.30	OK	0.95		0.81	1.11	1.13	OK
361	TOH RD M19	TOH RD M18	J		15.00		23829.00	1.944	2.1	75.753	311	427	500	HDPE	-96	1000	0.71	OK	0.78	OK	-1.68	-1.68	-1.70	3.62	3.80	OK
362	LN10 RD M2	LN10 RD M1	H		30.00		30.00	1.793	1.945	0.095	12	200	203	DWC	-197	180	1.01	OK	0.30	OK	0.69					

Sl. No.	Man Holes		Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		FLOWS LPS	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table	At Ultimate peak flow			Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To						Velocity (V)m/s	check (d/D<0.7)			Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)				From	To	Starting Manhole	Ending manhole						
393	TOH RD M9	TOH RD M8	C		27.00		24595.00	2.048	1.931	78.188	316	427	500	HDPE	231	1000	0.71	OK	0.78	OK	-1.89		-1.92	3.94	3.85	OK
394	TOH RD M8	TOH RD M7	C		16.00		24611.00	1.931	1.926	78.239	316	427	500	HDPE	3200	1000	0.71	OK	0.78	OK	-1.92		-1.94	3.85	3.87	OK
395	LN3 RD M5	LN3 RD M4	H		20.00		20.00	1.714	1.649	0.064	9	200	203	DWC	308	180	1.01	OK	0.30	OK	0.61		0.50	1.10	1.15	OK
396	LN3 RD M4	LN3 RD M3	C		25.00		45.00	1.649	1.764	0.143	14	200	203	DWC	-217	180	1.01	OK	0.30	OK	0.50		0.36	1.15	1.40	OK
397	LN3 RD M3	LN3 RD M2	C		23.00		68.00	1.764	1.971	0.216	17	200	203	DWC	-111	180	1.01	OK	0.30	OK	0.36		0.23	1.40	1.74	OK
398	LN3 RD M2	LN3 RD M1	C		30.00		98.00	1.971	2.044	0.312	20	200	203	DWC	-411	180	1.01	OK	0.30	OK	0.23		0.06	1.74	1.98	OK
399	LN3 RD M1	TOH RD M7	C		15.00		113.00	2.044	2.106	0.359	22	200	203	DWC	-242	180	1.01	OK	0.30	OK	0.06		-0.02	1.98	2.13	OK
400	TOH RD M7	TOH RD M6	J		25.00		24749.00	2.003	1.926	78.678	317	427	500	HDPE	325	1000	0.71	OK	0.78	OK	-1.94	-1.94	-1.97	3.94	3.90	OK
401	TOH RD M6	TOH RD M5	C		31.00		24780.00	2.003	2.106	78.777	317	427	500	HDPE	-301	1000	0.71	OK	0.78	OK	-1.97		-2.00	3.97	4.11	OK
402	LN2 RD M4	LN2 RD M3	H		26.00		26.00	1.644	1.764	0.083	11	200	203	DWC	-217	180	1.01	OK	0.30	OK	0.54		0.40	1.10	1.36	OK
403	LN2 RD M3	LN2 RD M2	C		30.00		56.00	1.764	1.971	0.178	16	200	203	DWC	-145	180	1.01	OK	0.30	OK	0.40		0.23	1.36	1.74	OK
404	LN2 RD M2	LN2 RD M1	C		26.00		82.00	1.971	2.044	0.261	19	200	203	DWC	-356	180	1.01	OK	0.30	OK	0.23		0.09	1.74	1.95	OK
405	LN2 RD M1	TOH RD M5	C		28.00		110.00	2.044	2.106	0.350	22	200	203	DWC	-452	180	1.01	OK	0.30	OK	0.09		-0.07	1.95	2.18	OK
406	TOH RD M5	TOH RD M4	J		24.00		24914.00	2.106	2.247	79.203	318	427	500	HDPE	-170	1000	0.71	OK	0.78	OK	-2.00	-2.00	-2.02	4.11	4.27	OK
407	TOH RD M4	TOH RD M3	C		27.00		24941.00	2.247	2.069	79.288	318	427	500	HDPE	152	1000	0.71	OK	0.78	OK	-2.02		-2.05	4.27	4.12	OK
408	LN1 RD M7	LN1 RD M6	H		12.00		12.00	1.892	1.931	0.038	7	200	203	DWC	-308	180	1.01	OK	0.30	OK	0.79		0.72	1.10	1.21	OK
409	LN1 RD M6	LN1 RD M5	C		25.00		37.00	1.931	1.944	0.118	13	200	203	DWC	-1923	180	1.01	OK	0.30	OK	0.72		0.58	1.21	1.36	OK
410	LN1 RD M5	LN1 RD M4	C		25.00		62.00	1.944	2.077	0.197	16	200	203	DWC	-188	180	1.01	OK	0.30	OK	0.58		0.44	1.36	1.64	OK
411	LN1 RD M4	LN1 RD M3	C		28.00		90.00	2.077	2.254	0.286	20	200	203	DWC	-158	180	1.01	OK	0.30	OK	0.44		0.28	1.64	1.97	OK
412	LN1 RD M3	LN1 RD M2	C		30.00		120.00	2.254	2.172	0.381	23	200	203	DWC	366	180	1.01	OK	0.30	OK	0.28		0.11	1.97	2.06	OK
413	LN1 RD M2	LN1 RD M1	C		30.00		150.00	2.172	2.262	0.477	25	200	203	DWC	-333	320	0.76	OK	0.30	OK	0.11		0.02	2.06	2.24	OK
414	LN1 RD M1	TOH RD M3	C		30.00		180.00	2.262	2.247	0.572	27	200	203	DWC	2000	320	0.76	OK	0.30	OK	0.02		-0.07	2.24	2.32	OK
415	TOH RD M3	TOH RD M2	J		14.00		25135.00	2.247	2.273	79.905	320	427	500	HDPE	-538	1000	0.71	OK	0.78	OK	-2.05	-2.05	-2.06	4.30	4.33	OK
416	TOH RD M2	TOH RD M1	C		27.00		25162.00	2.273	2.167	79.991	320	427	500	HDPE	255	1000	0.71	OK	0.78	OK	-2.06		-2.09	4.33	4.26	OK
417	TOH RD M1	SAYN RD M12	C		25.00		25187.00	2.167	2.458	80.070	320	427	500	HDPE	-86	1000	0.71	OK	0.78	OK	-2.09		-2.12	4.26	4.58	OK
418	SAYN RD M20	SAYN RD M19	H		30.00		30.00	4.582	3.662	0.095	12	200	203	DWC	33	32	2.40	OK	0.72	OK	3.48		2.54	1.10	1.12	OK
419	SAYN RD M19	SAYN RD M18	C		30.00		60.00	3.662	3.204	0.191	16	200	203	DWC	66	68	1.65	OK	0.49	OK	2.54		2.10	1.12	1.10	OK
420	SAYN RD M18	SAYN RD M17	C		30.00		90.00	3.204	2.747	0.286	20	200	203	DWC	66	65	1.68	OK	0.51	OK	2.10		1.64	1.10	1.11	OK
421	SAYN RD M17	SAYN RD M16	C		30.00		120.00	2.747	2.536	0.381	23	200	203	DWC	142	145	1.13	OK	0.34	OK	1.64		1.43	1.11	1.11	OK
422	SAYN RD M16	SAYN RD M15	C		30.00		150.00	2.536	2.324	0.477	25	200	203	DWC	142	145	1.13	OK	0.34	OK	1.43		1.22	1.11	1.10	OK
423	SAYN RD M15	SAYN RD M14	C		25.00		175.00	2.324	2.443	0.556	27	200	203	DWC	-210	320	0.76	OK	0.30	OK	1.22		1.14	1.10	1.30	OK
424	SAYN RD M14	SAYN RD M13	C		30.00		205.00	2.443	2.56	0.652	29	200	203	DWC	-256	420	0.66	OK	0.30	OK	1.14		1.07	1.30	1.49	OK
425	SAYN RD M13	SAYN RD M12	C		30.00		235.00	2.56	2.458	0.747	31	200	203	DWC	294	520	0.60	OK	0.30	OK	1.07		1.01	1.49	1.45	OK
426	LN8 RD M1	LN8 RD M2	H		25.00		25.00	2.834	2.84	0.079	11	200	203	DWC	-4167	180	1.01	OK	0.30	OK	1.73		1.59	1.10	1.25	OK
427	LN8 RD M4	LN8 RD M3	H		9.00		9.00	2.75	2.845	0.029	7	200	203	DWC	-95	180	1.01	OK	0.30	OK	1.65		1.60	1.10	1.25	OK
428	LN8 RD M3	LN8 RD M2	C		8.00		17.00	2.845	2.84	0.054	9	200	203	DWC	1600	180	1.01	OK	0.30	OK	1.60		1.56	1.25	1.28	OK
429	LN8 RD M2	ABA RD M2.1	J		13.00		55.00	2.84	2.84	0.175	15	200	203	DWC	0											

Sl. No.	Man Holes		Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		FLOWS LPS	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table		At Ultimate peak flow		Check Velocity (> 0.3m/s)	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To						Starting Manhole	Ending Manhole			Total Flow	ID				OD	Velocity (V)m/s	check (d/D<0.7)	Actual Velocity (v1) m/s		From	To	Starting Manhole	Ending manhole		
459	JT RD M5	JT RD M4	C		18.00		37.00	2.04	2.143	0.118	13	200	203	DWC	-175	180	1.01	OK	0.30	OK	0.90		0.80	1.14	1.34	OK	
460	JT RD M4	JT RD M3	C		13.00		50.00	2.143	2.268	0.159	15	200	203	DWC	-104	180	1.01	OK	0.30	OK	0.80		0.73	1.34	1.54	OK	
461	JT RD M3	JT RD M2	C		30.00		80.00	2.268	2.602	0.254	18	200	203	DWC	-90	180	1.01	OK	0.30	OK	0.73		0.56	1.54	2.04	OK	
462	JT RD M2	JT RD M1	C		30.00		110.00	2.602	2.83	0.350	22	200	203	DWC	-132	180	1.01	OK	0.30	OK	0.56		0.39	2.04	2.44	OK	
463	JT RD M1	JTA RD M5	C		30.00		140.00	2.83	2.287	0.445	24	200	203	DWC	55	180	1.01	OK	0.30	OK	0.39		0.22	2.44	2.07	OK	
464	JTA RD M5	JTA RD M4	J		14.00		801.00	2.287	2.097	2.546	57	200	203	DWC	74	520	0.60	OK	0.42	OK	0.22	0.22	0.19	2.07	1.91	OK	
465	JTA RD M4.2	JTA RD M4.1	H		28.00		28.00	2.404	2.405	0.089	11	200	203	DWC	-28000	180	1.01	OK	0.30	OK	1.30		1.14	1.10	1.27	OK	
466	JTA RD M4.1	JTA RD M4	C		30.00		58.00	2.405	2.097	0.184	16	200	203	DWC	97	180	1.01	OK	0.30	OK	1.14		0.97	1.27	1.13	OK	
467	JTA RD M4	JTA RD M3	J		20.00		879.00	2.097	2.051	2.794	60	200	203	DWC	435	520	0.60	OK	0.43	OK	0.19	0.19	0.15	1.91	1.90	OK	
468	JTA RD M3	JTA RD M2	C		23.00		902.00	2.051	1.987	2.867	61	200	203	DWC	359	520	0.60	OK	0.43	OK	0.15		0.11	1.90	1.88	OK	
469	JTA RD M2	JTA RD M1	C		20.00		922.00	1.987	2.012	2.931	62	200	203	DWC	-800	520	0.60	OK	0.44	OK	0.11		0.07	1.88	1.94	OK	
470	JTA RD M1	SAYN RD M5	C		22.00		944.00	2.012	2.7	3.001	62	200	203	DWC	-32	520	0.60	OK	0.44	OK	0.07		0.03	1.94	2.67	OK	
471	SAYN RD M1	SAYN RD M2	H		30.00		30.00	3.15	3.016	0.095	12	200	203	DWC	224	180	1.01	OK	0.30	OK	2.05		1.88	1.10	1.14	OK	
472	SAYN RD M2	SAYN RD M3	C		30.00		60.00	3.016	2.881	0.191	16	200	203	DWC	222	180	1.01	OK	0.30	OK	1.88		1.71	1.14	1.17	OK	
473	SAYN RD M3	SAYN RD M4	C		30.00		90.00	2.881	2.747	0.286	20	200	203	DWC	224	180	1.01	OK	0.30	OK	1.71		1.54	1.17	1.21	OK	
474	SAYN RD M4	SAYN RD M5	C		11.00		101.00	2.747	2.7	0.321	21	200	203	DWC	234	180	1.01	OK	0.30	OK	1.54		1.48	1.21	1.22	OK	
475	SAYN RD M5	SAYN RD M6	J		20.00		1065.00	2.7	2.619	3.386	66	200	203	DWC	247	520	0.60	OK	0.45	OK	0.03	0.03	-0.01	2.67	2.63	OK	
476	SAYN RD M6	SAYN RD M7	C		30.00		1095.00	2.619	2.582	3.481	67	200	203	DWC	811	520	0.60	OK	0.46	OK	-0.01		-0.07	2.63	2.65	OK	
477	SAYN RD M7	SAYN RD M8	C		30.00		1125.00	2.582	2.546	3.576	68	200	203	DWC	833	520	0.60	OK	0.46	OK	-0.07		-0.13	2.65	2.68	OK	
478	SAYN RD M8	SAYN RD M9	C		9.00		1134.00	2.546	2.534	3.605	68	200	203	DWC	750	520	0.60	OK	0.46	OK	-0.13		-0.15	2.68	2.68	OK	
479	SAYN RD M9.3	SAYN RD M9.2	H		16.00		16.00	2.202	2.121	0.051	9	200	203	DWC	198	180	1.01	OK	0.30	OK	1.10		1.01	1.10	1.11	OK	
480	SAYN RD M9.2	SAYN RD M9.1	C		14.00		30.00	2.121	2.174	0.095	12	200	203	DWC	-264	180	1.01	OK	0.30	OK	1.01		0.93	1.11	1.24	OK	
481	SAYN RD M9.1	SAYN RD M9	C		30.00		60.00	2.174	2.534	0.191	16	200	203	DWC	-83	180	1.01	OK	0.30	OK	0.93		0.76	1.24	1.77	OK	
482	SAYN RD M9	SAYN RD M10	J		21.00		1215.00	2.534	2.52	3.863	71	200	203	DWC	1500	180	1.01	OK	0.70	OK	-0.15	-0.15	-0.27	2.68	2.79	OK	
483	SAYN RD M10	SAYN RD M11	C		30.00		1245.00	2.52	2.495	3.958	72	200	203	DWC	1200	180	1.01	OK	0.70	OK	-0.27		-0.44	2.79	2.94	OK	
484	SAYN RD M11	SAYN RD M12	C		18.00		1263.00	2.495	2.458	4.015	72	200	203	DWC	486	180	1.01	OK	0.71	OK	-0.44		-0.54	2.94	3.00	OK	
485	SAYN RD M12	AMB RD M29	J		21.00		26706.00	2.495	2.57	84.899	329	427	500	HDPE	-280	1000	0.71	OK	0.80	OK	-2.12	-2.12	-2.14	4.62	4.71	OK	
486	JJ RD M12	JJ RD M13	H		27.00		27.00	2.954	2.915	0.086	11	200	203	DWC	692	180	1.01	OK	0.30	OK	1.85		1.70	1.10	1.22	OK	
487	JJ RD M13.1	JJ RD M13	H		32.00		32.00	2.994	2.915	0.102	12	200	203	DWC	405	180	1.01	OK	0.30	OK	1.89		1.71	1.10	1.21	OK	
488	JJ RD M13	JJ RD M14	J		30.00		89.00	2.915	2.873	0.283	19	200	203	DWC	714	180	1.01	OK	0.30	OK	1.70	1.70	1.53	1.22	1.34	OK	
489	JJ RD M14	JJ RD M15	C		30.00		119.00	2.873	2.901	0.378	22	200	203	DWC	-1071	180	1.01	OK	0.30	OK	1.53		1.36	1.34	1.54	OK	
490	JJ RD M15	JJ RD M16	C		30.00		149.00	2.901	2.774	0.474	25	200	203	DWC	236	180	1.01	OK	0.30	OK	1.36		1.19	1.54	1.58	OK	
491	JJ RD M16	JJ RD M17	C		18.00		167.00	2.774	2.737	0.531	27	200	203	DWC	486	420	0.66	OK	0.30	OK	1.19		1.15	1.58	1.59	OK	
492	JJ RD M17	JJ RD M18	C		21.00		188.00	2.737	2.626	0.598	28	200	203	DWC	189	420	0.66	OK	0.30	OK	1.15		1.10	1.59	1.53	OK	
493	JJ RD M18	JJ RD M19	C		20.00		208.00	2.626	2.633	0.661	30	200	203	DWC	-2857	520	0.60	OK	0.30	OK	1.10		1.06	1.53	1.57	OK	
494	JJ RD M26	JJ RD M25	H		14.00		14.00	2.684	2.757	0.045	8	200	203	DWC	-192	180	1.01	OK	0.30	OK	1.58		1.50	1.10	1.26	OK	
495	JJ RD M25	JJ RD M24	C		30.00		44.00	2.757	2.96	0.140	14	200	203	DWC	-148	180											

Sl. No.	Man Holes		Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		FLOWS LPS	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table	At Ultimate peak flow			Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To						Starting Manhole	Ending Manhole			Total Flow	ID				OD	Velocity (V)m/s	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)	From		To	Starting Manhole	
525	AMB RD M30	AMB RD M29	C		35.00		981.00	2.547	2.57	3.119	64	200	203	DWC	-1522	180	1.01	OK	0.66	OK	-0.20		-0.39	2.75	2.96	OK
526	AMB RD M29	AMB RD M28	J		20.00		27707.00	2.57	2.931	88.082	335	479	560	HDPE	-55	1000	0.77	OK	0.81	OK	-2.14	-2.140	-2.16	4.71	5.09	OK
527	AMB RD M28	AMB RD M27	C		30.00		27737.00	2.931	2.209	88.177	336	479	560	HDPE	42	1000	0.77	OK	0.81	OK	-2.16		-2.19	5.09	4.40	OK
528	AMB RD M27	AMB RD M26	C		30.00		27767.00	2.209	2.123	88.272	336	479	560	HDPE	349	1000	0.77	OK	0.81	OK	-2.19		-2.22	4.40	4.34	OK
529	AMB RD M26.4	AMB RD M26.3	H		30.00		30.00	2.014	2.136	0.095	12	200	203	DWC	-246	180	1.01	OK	0.30	OK	0.91		0.74	1.10	1.40	OK
530	AMB RD M26.3	AMB RD M26.2	C		15.00		45.00	2.136	2.025	0.143	14	200	203	DWC	135	180	1.01	OK	0.30	OK	0.74		0.66	1.40	1.37	OK
531	AMB RD M26.2	AMB RD M26.1	C		25.00		70.00	2.025	2.084	0.223	17	200	203	DWC	-424	180	1.01	OK	0.30	OK	0.66		0.52	1.37	1.56	OK
532	AMB RD M26.1	AMB RD M26	C		19.00		89.00	2.084	2.123	0.283	19	200	203	DWC	-487	180	1.01	OK	0.30	OK	0.52		0.41	1.56	1.71	OK
533	AMB RD M26	AMB RD M25	J		30.00		27886.00	2.123	2.128	88.651	337	479	560	HDPE	-6000	1000	0.77	OK	0.81	OK	-2.22	-2.220	-2.25	4.34	4.38	OK
534	AMB RD M25	AMB RD M24	C		30.00		27916.00	2.124	2.21	88.746	337	479	560	HDPE	-349	1000	0.77	OK	0.81	OK	-2.25		-2.28	4.37	4.49	OK
535	AMB RD M24	AMB RD M23	C		15.00		27931.00	2.21	2.231	88.794	337	479	560	HDPE	-714	1000	0.77	OK	0.81	OK	-2.28		-2.30	4.49	4.53	OK
536	AMB RD M23.1	AMB RD M23.2	H		30.00		30.00	2.334	2.267	0.095	12	200	203	DWC	448	180	1.01	OK	0.30	OK	1.23		1.06	1.10	1.21	OK
537	AMB RD M23.2	AMB RD M23.3	C		30.00		60.00	2.267	2.306	0.191	16	200	203	DWC	-769	180	1.01	OK	0.30	OK	1.06		0.89	1.21	1.42	OK
538	AMB RD M23.3	AMB RD M23.4	C		43.00		103.00	2.306	2.287	0.327	21	200	203	DWC	2263	180	1.01	OK	0.30	OK	0.89		0.65	1.42	1.64	OK
539	AMB RD M23.4	AMB RD M23.5	C		25.00		128.00	2.284	2.577	0.407	23	200	203	DWC	-85	320	0.76	OK	0.30	OK	0.65		0.57	1.63	2.01	OK
540	AMB RD M23.5	AMB RD M23.6	C		33.00		161.00	2.577	2.404	0.512	26	200	203	DWC	191	320	0.76	OK	0.30	OK	0.57		0.47	2.01	1.93	OK
541	AMB RD M23.6	AMB RD M23.7	C		20.00		181.00	2.404	2.317	0.575	28	200	203	DWC	230	320	0.76	OK	0.30	OK	0.47		0.41	1.93	1.91	OK
542	AMB RD M23.7	AMB RD M23	C		30.00		211.00	2.317	2.231	0.671	30	200	203	DWC	349	420	0.66	OK	0.30	OK	0.41		0.34	1.91	1.89	OK
543	AMB RD M23	AMB RD M22	J		30.00		28172.00	2.231	2.252	89.560	338	479	560	HDPE	-1429	1000	0.77	OK	0.81	OK	-2.30	-2.300	-2.33	4.53	4.58	OK
544	AMB RD M22.2.2	AMB RD M22.2.1	H		30.00		30.00	2.48	2.507	0.095	12	200	203	DWC	-1111	180	1.01	OK	0.30	OK	1.38		1.21	1.10	1.30	OK
545	AMB RD M22.2.1	AMB RD M22.2	C		30.00		60.00	2.507	2.254	0.191	16	200	203	DWC	119	180	1.01	OK	0.30	OK	1.21		1.04	1.30	1.21	OK
546	AMB RD M22.3	AMB RD M22.2	H		30.00		30.00	2.31	2.254	0.095	12	200	203	DWC	536	180	1.01	OK	0.30	OK	1.21		1.04	1.10	1.21	OK
547	AMB RD M22.2	AMB RD M22.1	J		22.00		112.00	2.254	2.264	0.356	22	200	203	DWC	-2200	180	1.01	OK	0.30	OK	1.04	1.040	0.92	1.21	1.34	OK
548	AMB RD M22.1	AMB RD M22	C		30.00		142.00	2.264	2.252	0.451	24	200	203	DWC	2500	320	0.76	OK	0.30	OK	0.92		0.83	1.34	1.42	OK
549	AMB RD M22	AMB RD M21	J		25.00		28339.00	2.252	2.25	90.091	339	479	560	HDPE	12500	1000	0.77	OK	0.81	OK	-2.33	-2.330	-2.36	4.58	4.61	OK
550	AMB RD M21	AMB RD M20	C		13.00		28352.00	2.25	2.277	90.132	339	479	560	HDPE	-481	1000	0.77	OK	0.81	OK	-2.36		-2.37	4.61	4.65	OK
551	AMB RD M20.3	AMB RD M20.2	H		19.00		19.00	2.322	2.31	0.060	9	200	203	DWC	1583	180	1.01	OK	0.30	OK	1.22		1.11	1.10	1.20	OK
552	AMB RD M20.2	AMB RD M20.1	C		30.00		49.00	2.31	2.299	0.156	15	200	203	DWC	2727	180	1.01	OK	0.30	OK	1.11		0.94	1.20	1.36	OK
553	AMB RD M20.1	AMB RD M20	C		30.00		79.00	2.299	2.277	0.251	18	200	203	DWC	1364	180	1.01	OK	0.30	OK	0.94		0.77	1.36	1.51	OK
554	AMB RD M20	AMB RD M19	J		30.00		28461.00	2.277	2.214	90.479	340	479	560	HDPE	476	1000	0.77	OK	0.81	OK	-2.37	-2.370	-2.40	4.65	4.61	OK
555	AMB RD M19.5	AMB RD M19.4	H		30.00		30.00	2.244	1.949	0.095	12	200	203	DWC	102	100	1.36	OK	0.41	OK	1.14		0.84	1.10	1.11	OK
556	AMB RD M19.4	AMB RD M19.3	C		30.00		60.00	1.949	2.016	0.191	16	200	203	DWC	-448	180	1.01	OK	0.30	OK	0.84		0.67	1.11	1.35	OK
557	AMB RD M19.3	AMB RD M19.2	C		27.00		87.00	2.016	2.083	0.277	19	200	203	DWC	-403	180	1.01	OK	0.30	OK	0.67		0.52	1.35	1.56	OK
558	AMB RD M19.2	AMB RD M19.1	C		30.00		117.00	2.083	2.217	0.372	22	200	203	DWC	-224	180	1.01	OK	0.30	OK	0.52		0.35	1.56	1.87	OK
559	AMB RD M19.1	AMB RD M19	C		30.00		147.00	2.217	2.214	0.467	25	200	203	DWC	10000	320	0.76	OK	0.30	OK	0.35		0.26	1.87	1.95	OK
560	AMB RD M19	AMB RD M18	J		34.00		28642.00	2.214	2.174	91.054	341	479	560	HDPE	850	1000	0.77	OK	0.82</							

Sl. No.	Man Holes		Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		FLOWS LPS	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table	At Ultimate peak flow			Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To						Starting Manhole	Ending Manhole			Total Flow	ID				OD	Velocity (V)m/s	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)	From		To	Starting Manhole	
591	AMB RD M15	AMB RD M14	C		13.00		29459.00	1.964	1.946	93.651	346	479	560	HDPE	722	1000	0.77	OK	0.82	OK	-2.52		-2.53	4.48	4.48	OK
592	AMB RD M14.3.1	AMB RD M14.3	H		30.00		30.00	2.544	2.227	0.095	12	200	203	DWC	95	95	1.39	OK	0.42	OK	1.44		1.12	1.10	1.11	OK
593	AMB RD M14.4	AMB RD M14.3	H		17.00		17.00	2.344	2.227	0.054	9	200	203	DWC	145	145	1.13	OK	0.34	OK	1.24		1.12	1.10	1.11	OK
594	AMB RD M14.3	AMB RD M14.2	J		32.00		79.00	2.227	2.128	0.251	18	200	203	DWC	323	180	1.01	OK	0.30	OK	1.12	1.120	0.94	1.11	1.19	OK
595	AMB RD M14.2	AMB RD M14.1	C		30.00		109.00	2.128	2.002	0.347	22	200	203	DWC	238	180	1.01	OK	0.30	OK	0.94		0.77	1.19	1.23	OK
596	AMB RD M14.1	AMB RD M14	C		30.00		139.00	2.002	1.944	0.442	24	200	203	DWC	517	320	0.76	OK	0.30	OK	0.77		0.68	1.23	1.26	OK
597	AMB RD M14	AMB RD M13	J		28.00		29626.00	1.944	1.957	94.182	347	479	560	HDPE	-2154	1000	0.77	OK	0.82	OK	-2.53	-2.530	-2.56	4.47	4.52	OK
598	AMB RD M13	AMB RD M12	C		30.00		29656.00	1.957	1.958	94.278	347	479	560	HDPE	-30000	1000	0.77	OK	0.82	OK	-2.56		-2.59	4.52	4.55	OK
599	AMB RD M12	AMB RD M11	C		26.00		29682.00	1.958	2.048	94.360	347	479	560	HDPE	-289	1000	0.77	OK	0.82	OK	-2.59		-2.62	4.55	4.67	OK
600	AMB RD M11.3	AMB RD M11.2	H		23.00		23.00	2.194	2.141	0.073	10	200	203	DWC	434	180	1.01	OK	0.30	OK	1.09		0.96	1.10	1.18	OK
601	AMB RD M11.2	AMB RD M11.1	C		26.00		49.00	2.141	2.202	0.156	15	200	203	DWC	-426	180	1.01	OK	0.30	OK	0.96		0.82	1.18	1.38	OK
602	AMB RD M11.1	AMB RD M11	C		30.00		79.00	2.202	2.048	0.251	18	200	203	DWC	195	180	1.01	OK	0.30	OK	0.82		0.65	1.38	1.40	OK
603	AMB RD M11	AMB RD M10	J		4.00		29765.00	2.048	2.082	94.624	348	479	560	HDPE	-118	1000	0.77	OK	0.82	OK	-2.62	-2.620	-2.62	4.67	4.70	OK
604	AMB Cr RD M4	AMB Cr RD M3	H		30.00		30.00	2.654	2.578	0.095	12	200	203	DWC	395	180	1.01	OK	0.30	OK	1.55		1.38	1.10	1.20	OK
605	AMB Cr RD M3	AMB Cr RD M2	C		30.00		60.00	2.578	2.298	0.191	16	200	203	DWC	107	160	1.07	OK	0.32	OK	1.38		1.19	1.20	1.11	OK
606	AMB Cr RD M2	AMB Cr RD M1	C		30.00		90.00	2.298	2.128	0.286	20	200	203	DWC	176	180	1.01	OK	0.30	OK	1.19		1.02	1.11	1.11	OK
607	AMB Cr RD M1	AMB RD M10	C		21.00		111.00	2.128	2.082	0.353	22	200	203	DWC	457	180	1.01	OK	0.30	OK	1.02		0.90	1.11	1.18	OK
608	AMB RD M10	AMB RD M9	J		25.00		29901.00	2.082	2.037	95.056	348	479	560	HDPE	556	1000	0.77	OK	0.83	OK	-2.62	-2.620	-2.65	4.70	4.69	OK
609	AMB RD M9	AMB RD M8	C		12.00		29913.00	2.037	1.98	95.095	349	479	560	HDPE	211	1000	0.77	OK	0.83	OK	-2.65		-2.66	4.69	4.64	OK
610	AMB RD M8	AMB RD M7	C		30.00		29943.00	1.98	2.008	95.190	349	479	560	HDPE	-1071	1000	0.77	OK	0.83	OK	-2.66		-2.69	4.64	4.70	OK
611	AMB RD M7	AMB RD M6	C		30.00		29973.00	2.008	1.97	95.285	349	479	560	HDPE	789	1000	0.77	OK	0.83	OK	-2.69		-2.72	4.70	4.69	OK
612	AMB RD M6	AMB RD M5	C		34.00		30007.00	1.97	1.933	95.393	349	479	560	HDPE	919	1000	0.77	OK	0.83	OK	-2.72		-2.75	4.69	4.68	OK
613	AMB RD M5	AMB RD M4	C		13.00		30020.00	1.933	2.159	95.435	349	479	560	HDPE	-58	1000	0.77	OK	0.83	OK	-2.75		-2.76	4.68	4.92	OK
614	AMB RD M4	AMB RD M3	C		29.00		30049.00	2.159	2.274	95.527	349	479	560	HDPE	-252	1000	0.77	OK	0.83	OK	-2.76		-2.79	4.92	5.06	OK
615	JJ RD M11	JJ RD M10	H		30.00		30.00	3.031	3.069	0.095	12	200	203	DWC	-789	180	1.01	OK	0.30	OK	1.93		1.76	1.10	1.31	OK
616	JJ RD M10	JJ RD M9	C		30.00		60.00	3.069	2.728	0.191	16	200	203	DWC	88	180	1.01	OK	0.30	OK	1.76		1.59	1.31	1.14	OK
617	JJ RD M9	JJ RD M8	C		10.00		70.00	2.728	2.722	0.223	17	200	203	DWC	1667	180	1.01	OK	0.30	OK	1.59		1.53	1.14	1.19	OK
618	JJ RD M8	JJ RD M7	C		19.00		89.00	2.722	2.644	0.283	19	200	203	DWC	244	180	1.01	OK	0.30	OK	1.53		1.42	1.19	1.22	OK
619	JJ RD M7	JJ RD M6	C		30.00		119.00	2.644	2.642	0.378	22	200	203	DWC	15000	180	1.01	OK	0.30	OK	1.42		1.25	1.22	1.39	OK
620	JJ RD M6	JJ RD M5	C		30.00		149.00	2.642	2.485	0.474	25	200	203	DWC	191	320	0.76	OK	0.30	OK	1.25		1.16	1.39	1.33	OK
621	JJ RD M5	JJ RD M4	C		31.00		180.00	2.485	2.171	0.572	27	200	203	DWC	99	320	0.76	OK	0.30	OK	1.16		1.06	1.33	1.11	OK
622	JJ RD M4.2	JJ RD M4.1	H		25.00		25.00	2.304	2.279	0.079	11	200	203	DWC	1000	180	1.01	OK	0.30	OK	1.20		1.06	1.10	1.22	OK
623	JJ RD M4.1	JJ RD M4	C		30.00		55.00	2.279	2.171	0.175	15	200	203	DWC	278	180	1.01	OK	0.30	OK	1.06		0.89	1.22	1.28	OK
624	JJ RD M4	JJ RD M3	J		27.00		262.00	2.171	2.054	0.833	33	200	203	DWC	231	520	0.60	OK	0.30	OK	0.89	0.890	0.84	1.28	1.21	OK
625	JJ RD M3.1	JJ RD M3	H		24.00		24.00	2.054	2.081	0.076	10	200	203	DWC	-889	180	1.01	OK	0.30	OK	0.95		0.82	1.10	1.26	OK
626	JJ RD M3	JJ RD M2	J		30.00		316.00	2.056	2.332	1.005	36	200	203	DWC	-109	250	0.86	OK	0.44	OK	0.82	0.820	0.70	1.24	1.63	OK
627	JJ RD M2	JJ RD M1	C</																							

Sl. No.	Man Holes		Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		FLOWS LPS	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table	At Ultimate peak flow			Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To						Starting Manhole	Ending Manhole			Total Flow	ID				OD	Velocity (V)m/s	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)	From		To	Starting Manhole	
657	BV RD M 12	BV RD M 13	C		30.00		594.00	2.152	2.086	1.888	50	200	203	DWC	455	520	0.60	OK	0.39	OK	-0.18		-0.24	2.33	2.33	OK
658	BV RD M 13	BV RD M 14	C		30.00		624.00	2.086	2.129	1.984	51	200	203	DWC	-698	520	0.60	OK	0.40	OK	-0.24		-0.30	2.33	2.43	OK
659	BV RD M 14	BV RD M 15	C		30.00		654.00	2.129	2.168	2.079	52	200	203	DWC	-769	520	0.60	OK	0.40	OK	-0.30		-0.36	2.43	2.53	OK
660	BV RD M 15.1	BV RD M 15.2	H		20.00		20.00	2.132	2.333	0.064	9	200	203	DWC	-100	180	1.01	OK	0.30	OK	1.03		0.92	1.10	1.41	OK
661	BV RD M 15.2	BV RD M 15	C		36.00		56.00	2.333	2.168	0.178	16	200	203	DWC	218	180	1.01	OK	0.30	OK	0.92		0.72	1.41	1.45	OK
662	BV RD M 15	BV RD M 16	J		14.00		724.00	2.168	2.129	2.302	55	200	203	DWC	359	520	0.60	OK	0.41	OK	-0.36	-0.360	-0.39	2.53	2.52	OK
663	BV RD M 16	BV RD M 17	C		30.00		754.00	2.129	2.089	2.397	56	200	203	DWC	750	520	0.60	OK	0.42	OK	-0.39		-0.45	2.52	2.54	OK
664	BV RD M 17	BV RD M 18	C		30.00		784.00	2.089	1.977	2.492	57	200	203	DWC	268	520	0.60	OK	0.42	OK	-0.45		-0.51	2.54	2.49	OK
665	BV RD M 18	BV RD M 19	C		30.00		814.00	1.977	2.005	2.588	58	200	203	DWC	-1071	520	0.60	OK	0.42	OK	-0.51		-0.57	2.49	2.58	OK
666	BV RD M 19	BV RD M 20	C		30.00		844.00	2.005	1.978	2.683	59	200	203	DWC	1111	520	0.60	OK	0.42	OK	-0.57		-0.63	2.58	2.61	OK
667	BV RD M 20	SBC RD M17	C		15.00		859.00	1.978	2.004	2.731	59	200	203	DWC	-577	520	0.60	OK	0.43	OK	-0.63		-0.66	2.61	2.66	OK
668	SBC RD M17	SBC RD M16	C		24.00		883.00	2.004	2.208	2.807	60	200	203	DWC	-118	520	0.60	OK	0.43	OK	-0.66		-0.71	2.66	2.92	OK
669	SBC RD M16	SBC RD M15	J		32.00		48726.00	2.208	2.132	154.902	445	539	630	HDPE	421	1000	0.83	OK	0.92	OK	-2.84	-2.840	-2.87	5.05	5.00	OK
670	SBC RD M15	SBC RD M14	C		30.00		48756.00	2.132	2.076	154.997	445	539	630	HDPE	536	1000	0.83	OK	0.92	OK	-2.87		-2.90	5.00	4.98	OK
671	SBC RD M14	SBC RD M13	C		30.00		48786.00	2.076	2.027	155.093	445	539	630	HDPE	612	1000	0.83	OK	0.92	OK	-2.90		-2.93	4.98	4.96	OK
672	SBC RD M13	SBC RD M12	C		30.00		48816.00	2.027	2.153	155.188	445	539	630	HDPE	-238	1000	0.83	OK	0.92	OK	-2.93		-2.96	4.96	5.11	OK
673	KB RD M1	KB RD M2	H		18.00		18.00	3.224	3.229	0.057	9	200	203	DWC	-3600	180	1.01	OK	0.30	OK	2.12		2.02	1.10	1.21	OK
674	KB RD M2	KB RD M3	C		30.00		48.00	3.229	3.163	0.153	14	200	203	DWC	455	180	1.01	OK	0.30	OK	2.02		1.85	1.21	1.31	OK
675	KB RD M3	KB RD M4	C		30.00		78.00	3.163	3.106	0.248	18	200	203	DWC	526	180	1.01	OK	0.30	OK	1.85		1.68	1.31	1.43	OK
676	KB RD M4	KB RD M5	C		30.00		108.00	3.106	3.001	0.343	21	200	203	DWC	286	180	1.01	OK	0.30	OK	1.68		1.51	1.43	1.49	OK
677	KB RD M5	KB RD M6	C		30.00		138.00	3.001	2.966	0.439	24	200	203	DWC	857	180	1.01	OK	0.30	OK	1.51		1.34	1.49	1.63	OK
678	KB RD M6.8	KB RD M6.7	H		20.00		20.00	3.113	2.871	0.064	9	200	203	DWC	83	83	1.49	OK	0.45	OK	2.01		1.77	1.10	1.10	OK
679	KB RD M6.7	KB RD M6.6	C		30.00		50.00	2.871	3.08	0.159	15	200	203	DWC	-144	180	1.01	OK	0.30	OK	1.77		1.60	1.10	1.48	OK
680	KB RD M6.6	KB RD M6.5	C		30.00		80.00	3.08	2.948	0.254	18	200	203	DWC	227	180	1.01	OK	0.30	OK	1.60		1.43	1.48	1.52	OK
681	KB RD M6.5	KB RD M6.4	C		30.00		110.00	2.948	2.834	0.350	22	200	203	DWC	263	180	1.01	OK	0.30	OK	1.43		1.26	1.52	1.57	OK
682	KB RD M6.4	KB RD M6.3	C		30.00		140.00	2.834	2.845	0.445	24	200	203	DWC	-2727	180	1.01	OK	0.30	OK	1.26		1.09	1.57	1.76	OK
683	KB RD M6.3	KB RD M6.2	C		30.00		170.00	2.845	2.851	0.540	27	200	203	DWC	-5000	420	0.66	OK	0.30	OK	1.09		1.02	1.76	1.83	OK
684	KB RD M6.2	KB RD M6.1	C		30.00		200.00	2.851	2.906	0.636	29	200	203	DWC	-545	420	0.66	OK	0.30	OK	1.02		0.95	1.83	1.96	OK
685	KB RD M6.1	KB RD M6	C		30.00		230.00	2.906	2.966	0.731	31	200	203	DWC	-500	520	0.60	OK	0.30	OK	0.95		0.89	1.96	2.08	OK
686	KB RD M6	KB RD M7	J		33.00		401.00	2.966	2.048	1.275	41	200	203	DWC	36	520	0.60	OK	0.35	OK	0.89	0.890	0.83	2.08	1.22	OK
687	KB RD M7.1	KB RD M7.2	H		16.00		16.00	2.004	2.025	0.051	9	200	203	DWC	-762	180	1.01	OK	0.30	OK	0.90		0.81	1.10	1.22	OK
688	KB RD M7.2	KB RD M7.3	C		30.00		46.00	2.025	2.039	0.146	14	200	203	DWC	-2143	180	1.01	OK	0.30	OK	0.81		0.64	1.22	1.40	OK
689	KB RD M7.3	KB RD M7.4	C		15.00		61.00	2.039	2.004	0.194	16	200	203	DWC	429	180	1.01	OK	0.30	OK	0.64		0.56	1.40	1.44	OK
690	KB RD M7.4	KB RD M7.5	C		25.00		86.00	2.004	1.994	0.273	19	200	203	DWC	2500	180	1.01	OK	0.30	OK	0.56		0.42	1.44	1.57	OK
691	KB RD M7.5.2	KB RD M7.5.1	H		20.00		20.00	1.994	2.276	0.064	9	200	203	DWC	-71	180	1.01	OK	0.30	OK	0.89		0.78	1.10	1.50	OK
692	KB RD M7.5.1	KB RD M7.5	C		30.00		50.00	2.276	1.994	0.159	15	200	203	DWC	106	180	1.01	OK	0.30	OK	0.78		0.61	1.50	1.38	OK
693	KB RD M7.5	KB RD M7.6	J		30.00																					

Sl. No.	Man Holes		Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		FLOWS LPS	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table	At Ultimate peak flow		Check Velocity (> 0.3m/s)	Invert Level in m			Depth of cutting in m		Check Depth of cutting
								Starting Manhole	Ending Manhole			ID	OD				Velocity (V)m/s	check (d/D<0.7)	Actual Velocity (v1) m/s		From		To	Starting Manhole	Ending manhole	
723	KB RD M12	KB RD M13	J		30.00		1342.00	1.916	1.914	4.266	74	200	203	DWC	15000	520	0.60	OK	0.48	OK	-0.77	-0.770	-0.83	2.69	2.74	OK
724	KB RD M13	KB RD M14	C		30.00		1372.00	1.914	1.906	4.362	75	200	203	DWC	3750	520	0.60	OK	0.48	OK	-0.83		-0.89	2.74	2.80	OK
725	KB RD M14	KB RD M15	C		30.00		1402.00	1.906	1.872	4.457	76	200	203	DWC	882	520	0.60	OK	0.49	OK	-0.89		-0.95	2.80	2.82	OK
726	KB RD M15.4	KB RD M15.3	H		30.00		30.00	1.744	1.789	0.095	12	200	203	DWC	-667	180	1.01	OK	0.30	OK	0.64		0.47	1.10	1.32	OK
727	KB RD M15.3	KB RD M15.2	C		30.00		60.00	1.789	1.83	0.191	16	200	203	DWC	-732	180	1.01	OK	0.30	OK	0.47		0.30	1.32	1.53	OK
728	KB RD M15.2	KB RD M15.1	C		30.00		90.00	1.83	1.851	0.286	20	200	203	DWC	-1429	180	1.01	OK	0.30	OK	0.30		0.13	1.53	1.72	OK
729	KB RD M15.1	KB RD M15	C		30.00		120.00	1.851	1.872	0.381	23	200	203	DWC	-1429	180	1.01	OK	0.30	OK	0.13		-0.04	1.72	1.91	OK
730	KB RD M15.5	KB RD M15.6	H		29.00		29.00	1.321	1.364	0.092	11	200	203	DWC	-674	180	1.01	OK	0.30	OK	0.22		0.06	1.10	1.30	OK
731	KB RD M15.6	KB RD M15.7	C		18.00		47.00	1.364	1.407	0.149	14	200	203	DWC	-419	180	1.01	OK	0.30	OK	0.06		-0.04	1.30	1.45	OK
732	KB RD M15.7	KB RD M15.8	C		25.00		72.00	1.407	1.493	0.229	18	200	203	DWC	-291	180	1.01	OK	0.30	OK	-0.04		-0.18	1.45	1.67	OK
733	KB RD M15.8	KB RD M15.9	C		30.00		102.00	1.493	1.579	0.324	21	200	203	DWC	-349	180	1.01	OK	0.30	OK	-0.18		-0.35	1.67	1.93	OK
734	KB RD M15.9	KB RD M15.10	C		24.00		126.00	1.579	1.665	0.401	23	200	203	DWC	-279	180	1.01	OK	0.30	OK	-0.35		-0.48	1.93	2.15	OK
735	KB RD M15.12	KB RD M15.11	H		25.00		25.00	1.454	1.596	0.079	11	200	203	DWC	-176	180	1.01	OK	0.30	OK	0.35		0.21	1.10	1.39	OK
736	KB RD M15.11	KB RD M15.10	C		30.00		55.00	1.596	1.665	0.175	15	200	203	DWC	-435	180	1.01	OK	0.30	OK	0.21		0.04	1.39	1.63	OK
737	KB RD M15.10	KB RD M15.13	J		17.00		198.00	1.665	1.734	0.629	29	200	203	DWC	-246	420	0.66	OK	0.30	OK	-0.48	-0.480	-0.52	2.15	2.25	OK
738	KB RD M15.13	KB RD M15	C		25.00		223.00	1.734	1.872	0.709	31	200	203	DWC	-181	520	0.60	OK	0.30	OK	-0.52		-0.57	2.25	2.44	OK
739	KB RD M15	KB RD M16	J		15.00		1760.00	1.872	1.974	5.595	85	200	203	DWC	-147	520	0.60	OK	0.52	OK	-0.95	-0.950	-0.98	2.82	2.95	OK
740	KB RD M16	KB RD M17	C		25.00		1785.00	1.974	2.219	5.675	86	200	203	DWC	-102	520	0.60	OK	0.52	OK	-0.98		-1.03	2.95	3.25	OK
741	KB RD M17	KB RD M18	C		28.00		1813.00	2.219	1.974	5.764	86	200	203	DWC	114	520	0.60	OK	0.52	OK	-1.03		-1.08	3.25	3.05	OK
742	KB RD M18.1	KB RD M18.2	H		28.00		28.00	1.91	1.843	0.089	11	200	203	DWC	418	180	1.01	OK	0.30	OK	0.81		0.65	1.10	1.19	OK
743	KB RD M18.2	KB RD M18.3	C		30.00		58.00	1.843	1.848	0.184	16	200	203	DWC	-6000	180	1.01	OK	0.30	OK	0.65		0.48	1.19	1.37	OK
744	KB RD M18.3	KB RD M18.4	C		30.00		88.00	1.848	1.984	0.280	19	200	203	DWC	-221	180	1.01	OK	0.30	OK	0.48		0.31	1.37	1.67	OK
745	KB RD M18.4	KB RD M18	C		30.00		118.00	1.984	1.974	0.375	22	200	203	DWC	3000	180	1.01	OK	0.30	OK	0.31		0.14	1.67	1.83	OK
746	KB RD M18	KB RD M19	J		33.00		1964.00	1.974	1.91	6.244	90	200	203	DWC	516	520	0.60	OK	0.54	OK	-1.08	-1.080	-1.14	3.05	3.05	OK
747	KB RD M19	KB RD M20	C		30.00		1994.00	1.91	1.906	6.339	90	200	203	DWC	7500	520	0.60	OK	0.54	OK	-1.14		-1.20	3.05	3.11	OK
748	KB RD M20.1	KB RD M20.2	H		32.00		32.00	1.901	2.009	0.102	12	200	203	DWC	-296	180	1.01	OK	0.30	OK	0.80		0.62	1.10	1.39	OK
749	KB RD M20.2	KB RD M20.3	C		30.00		62.00	2.009	2.058	0.197	16	200	203	DWC	-612	180	1.01	OK	0.30	OK	0.62		0.45	1.39	1.61	OK
750	KB RD M20.3	KB RD M20.4	C		30.00		92.00	2.058	2.124	0.292	20	200	203	DWC	-455	180	1.01	OK	0.30	OK	0.45		0.28	1.61	1.84	OK
751	KB RD M20.4	KB RD M20	C		30.00		122.00	2.124	1.904	0.388	23	200	203	DWC	136	180	1.01	OK	0.30	OK	0.28		0.11	1.84	1.79	OK
752	KB RD M20	KB RD M21	J		10.00		2126.00	1.904	1.973	6.759	93	200	203	DWC	-145	520	0.60	OK	0.55	OK	-1.20	-1.200	-1.22	3.10	3.19	OK
753	KB RD M21.1	KB RD M21.2	H		30.00		30.00	1.464	1.531	0.095	12	200	203	DWC	-448	180	1.01	OK	0.30	OK	0.36		0.19	1.10	1.34	OK
754	KB RD M21.2	KB RD M21.3	C		30.00		60.00	1.531	1.594	0.191	16	200	203	DWC	-476	180	1.01	OK	0.30	OK	0.19		0.02	1.34	1.57	OK
755	KB RD M21.3	KB RD M21.4	C		30.00		90.00	1.594	1.72	0.286	20	200	203	DWC	-238	180	1.01	OK	0.30	OK	0.02		-0.15	1.57	1.87	OK
756	KB RD M21.4	KB RD M21.5	C		13.00		103.00	1.72	1.783	0.327	21	200	203	DWC	-206	180	1.01	OK	0.30	OK	-0.15		-0.22	1.87	2.00	OK
757	KB RD M21.5	KB RD M21.6	C		17.00		120.00	1.783	1.846	0.381	23	200	203	DWC	-270	180	1.01	OK	0.30	OK	-0.22		-0.31	2.00	2.16	OK
758	KB RD M21.6	KB RD M21	C		25.00		145.00	1.846	1.973	0.461	25	200	203	DWC	-197	180	1.01	OK	0.30	OK	-0.31		-0.45	2.16	2.42	OK
759	KB RD M21	KB RD M22	J		12.00		2283.00	1.973	1.952	7.258	97	200	203	DWC	571	520	0.60	OK	0.56	OK	-1.22	-1.220	-1.24	3.19	3.19	OK
760	KB RD M22.1	KB RD M22.2	H		25.00		25.00	2.083	1.829	0.079	11	200	203	DWC	98	98	1.37	OK	0.41	OK	0.98		0.72	1.10	1.11	OK
761	KB RD M22.2	KB RD M22.3	C		30.00		55.00	1.829	1.937	0.175	15	200	203	DWC	-278	180	1.01	OK	0.30	OK	0.72		0.55	1.11	1.39	OK
762	KB RD M22.3	KB RD M22.4	C		30.00		85.00	1.937	2.042	0.270	19	200	203	DWC	-286	180	1.01	OK	0.30	OK	0.55		0.38	1.39	1.66	OK

Sl. No.	Man Holes		Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		FLOWS LPS	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table	At Ultimate peak flow			Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To						Velocity (V)m/s	check (d/D<0.7)			Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)				From		To	Starting Manhole	Ending manhole					
763	KB RD M22.4	KB RD M22	C		30.00		115.00	2.042	1.952	0.366	22	200	203	DWC	333	180	1.01	OK	0.30	OK	0.38		0.21	1.66	1.74	OK
764	KB RD M22	KB RD M23	J		21.00		2419.00	1.952	2.041	7.690	99	200	203	DWC	-236	520	0.60	OK	0.57	OK	-1.24	-1.240	-1.28	3.19	3.32	OK
765	GG RD M4	GG RD M3	H		28.00		28.00	2.014	1.984	0.089	11	200	203	DWC	933	180	1.01	OK	0.30	OK	0.91		0.75	1.10	1.23	OK
766	GG RD M3	GG RD M2	C		30.00		58.00	1.984	1.931	0.184	16	200	203	DWC	566	180	1.01	OK	0.30	OK	0.75		0.58	1.23	1.35	OK
767	GG RD M2	GG RD M1	C		30.00		88.00	1.931	1.901	0.280	19	200	203	DWC	1000	180	1.01	OK	0.30	OK	0.58		0.41	1.35	1.49	OK
768	GG RD M1	KB RD M23	C		30.00		118.00	1.901	2.041	0.375	22	200	203	DWC	-214	180	1.01	OK	0.30	OK	0.41		0.24	1.49	1.80	OK
769	KB RD M23	KB RD M24	J		15.00		2552.00	2.041	2.131	8.113	102	200	203	DWC	-167	520	0.60	OK	0.58	OK	-1.28	-1.280	-1.31	3.32	3.44	OK
770	MP Ln RD M1	MP Ln RD M2	H		30.00		30.00	1.874	2.083	0.095	12	200	203	DWC	-144	180	1.01	OK	0.30	OK	0.77		0.60	1.10	1.48	OK
771	MP Ln RD M2	MP Ln RD M3	C		30.00		60.00	2.083	2.064	0.191	16	200	203	DWC	1579	180	1.01	OK	0.30	OK	0.60		0.43	1.48	1.63	OK
772	MP Ln RD M3	MP Ln RD M4	C		30.00		90.00	2.064	2.154	0.286	20	200	203	DWC	-333	180	1.01	OK	0.30	OK	0.43		0.26	1.63	1.89	OK
773	MP Ln RD M4	MP Ln RD M5	C		30.00		120.00	2.154	2.238	0.381	23	200	203	DWC	-357	180	1.01	OK	0.30	OK	0.26		0.09	1.89	2.15	OK
774	MP Ln RD M5	KB RD M24	C		30.00		150.00	2.238	2.131	0.477	25	200	203	DWC	280	180	1.01	OK	0.30	OK	0.09		-0.08	2.15	2.21	OK
775	OG Ln RD M2	OG Ln RD M1	H		30.00		30.00	2.094	2.075	0.095	12	200	203	DWC	1579	180	1.01	OK	0.30	OK	0.99		0.82	1.10	1.26	OK
776	OG Ln RD M1	KB RD M24	C		30.00		60.00	2.075	2.131	0.191	16	200	203	DWC	-536	180	1.01	OK	0.30	OK	0.82		0.65	1.26	1.48	OK
777	KB RD M24	KB RD M25	J		19.00		2781.00	2.131	1.952	8.841	107	200	203	DWC	106	520	0.60	OK	0.59	OK	-1.31	-1.310	-1.35	3.44	3.30	OK
778	KB RD M25	KB RD M26	C		25.00		2806.00	1.952	1.904	8.920	107	200	203	DWC	521	520	0.60	OK	0.59	OK	-1.35		-1.40	3.30	3.30	OK
779	RN2 RD M1	RN2 RD M2	H		18.00		18.00	1.694	1.744	0.057	9	200	203	DWC	-360	180	1.01	OK	0.30	OK	0.59		0.49	1.10	1.25	OK
780	RN2 RD M2	RN2 RD M3	C		30.00		48.00	1.744	1.795	0.153	14	200	203	DWC	-588	180	1.01	OK	0.30	OK	0.49		0.32	1.25	1.48	OK
781	RN2 RD M3.1	RN2 RD M3	H		14.00		14.00	1.784	1.795	0.045	8	200	203	DWC	-1273	180	1.01	OK	0.30	OK	0.68		0.60	1.10	1.20	OK
782	RN2 RD M3	RN2 RD M4	J		20.00		82.00	1.795	1.823	0.261	19	200	203	DWC	-714	180	1.01	OK	0.30	OK	0.32	0.320	0.21	1.48	1.61	OK
783	RN2 RD M4	RN2 RD M5	C		20.00		102.00	1.823	1.924	0.324	21	200	203	DWC	-198	180	1.01	OK	0.30	OK	0.21		0.10	1.61	1.82	OK
784	RN2 RD M5	RN2 RD M6	C		30.00		132.00	1.924	1.983	0.420	24	200	203	DWC	-508	180	1.01	OK	0.30	OK	0.10		-0.07	1.82	2.05	OK
785	RN2 RD M6	KB RD M26	C		30.00		162.00	1.983	1.904	0.515	26	200	203	DWC	380	320	0.76	OK	0.30	OK	-0.07		-0.16	2.05	2.06	OK
786	EX LN RD M3	EX LN RD M2	H		30.00		30.00	2.243	2.162	0.095	12	200	203	DWC	370	180	1.01	OK	0.30	OK	1.14		0.97	1.10	1.19	OK
787	EX LN RD M2	EX LN RD M1	C		30.00		60.00	2.162	2.092	0.191	16	200	203	DWC	429	180	1.01	OK	0.30	OK	0.97		0.80	1.19	1.29	OK
788	EX LN RD M1	KB RD M26	C		30.00		90.00	2.092	1.904	0.286	20	200	203	DWC	160	180	1.01	OK	0.30	OK	0.80		0.63	1.29	1.27	OK
789	KB RD M26	KB RD M27	J		29.00		3087.00	1.904	1.853	9.814	112	200	203	DWC	569	520	0.60	OK	0.60	OK	-1.40	-1.400	-1.46	3.30	3.31	OK
790	KB RD M27	KB RD M28	C		30.00		3117.00	1.853	1.809	9.909	113	200	203	DWC	682	520	0.60	OK	0.61	OK	-1.46		-1.52	3.31	3.33	OK
791	KB RD M28	KB RD M29	C		17.00		3134.00	1.809	1.814	9.963	113	200	203	DWC	-3400	520	0.60	OK	0.61	OK	-1.52		-1.55	3.33	3.36	OK
792	KB RD M29.4	KB RD M29.3	H		15.00		15.00	1.954	1.92	0.048	8	200	203	DWC	441	180	1.01	OK	0.30	OK	0.85		0.77	1.10	1.15	OK
793	KB RD M29.3	KB RD M29.2	C		30.00		45.00	1.92	1.885	0.143	14	200	203	DWC	857	180	1.01	OK	0.30	OK	0.77		0.60	1.15	1.29	OK
794	KB RD M29.2	KB RD M29.1	C		30.00		75.00	1.885	1.85	0.238	18	200	203	DWC	857	180	1.01	OK	0.30	OK	0.60		0.43	1.29	1.42	OK
795	KB RD M29.1	KB RD M29	C		30.00		105.00	1.85	1.814	0.334	21	200	203	DWC	833	180	1.01	OK	0.30	OK	0.43		0.26	1.42	1.55	OK
796	KB RD M29	KB RD M30	J		23.00		3262.00	1.814	1.812	10.370	115	200	203	DWC	11500	520	0.60	OK	0.61	OK	-1.55	-1.550	-1.59	3.36	3.40	OK
797	KB RD M30	KB RD M31	C		30.00		3292.00	1.812	1.869	10.465	116	200	203	DWC	-526	520	0.60	OK	0.61	OK	-1.59		-1.65	3.40	3.52	OK
798	KB RD M31	KB RD M32	C		28.00		3320.00	1.869	1.799	10.554	116	200	203	DWC	400	520	0.60	OK	0.61	OK	-1.65		-1.70	3.52	3.50	OK
799	KB RD M32	KB RD M33	C		30.00		3350.00	1.799	1.974	10.650	117	2														

Sl. No.	Man Holes		Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		FLOWS LPS	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table	At Ultimate peak flow			Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To						Starting Manhole	Ending Manhole			ID	OD				Velocity (V)m/s	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)	From		To	Starting Manhole	Ending manhole	
829	PN LN2 RD M4.2	PN LN2 RD M4.3	C		30.00		60.00	2.042	1.984	0.191	16	200	203	DWC	517	180	1.01	OK	0.30	OK	0.84		0.67	1.20	1.31	OK
830	PN LN2 RD M4.3	PN LN2 RD M4.4	C		30.00		90.00	1.984	2.044	0.286	20	200	203	DWC	-500	180	1.01	OK	0.30	OK	0.67		0.50	1.31	1.54	OK
831	PN LN2 RD M4.4	PN LN2 RD M4	C		30.00		120.00	2.044	2.011	0.381	23	200	203	DWC	909	180	1.01	OK	0.30	OK	0.50		0.33	1.54	1.68	OK
832	PN LN2 RD M4	PN LN2 RD M3	J		30.00		335.00	2.011	2.119	1.065	37	200	203	DWC	-278	520	0.60	OK	0.33	OK	0.02	0.020	-0.04	1.99	2.16	OK
833	PN LN2 RD M3	PN LN2 RD M2	C		30.00		365.00	2.119	2.334	1.160	39	200	203	DWC	-140	520	0.60	OK	0.33	OK	-0.04		-0.10	2.16	2.43	OK
834	PN LN2 RD M2	PN LN2 RD M1	C		30.00		395.00	2.334	2.166	1.256	40	200	203	DWC	179	520	0.60	OK	0.35	OK	-0.10		-0.16	2.43	2.33	OK
835	PN LN2 RD M1	SBC RD M5	C		26.00		421.00	2.166	2.124	1.338	42	200	203	DWC	619	520	0.60	OK	0.35	OK	-0.16		-0.21	2.33	2.33	OK
836	SBC RD M5	SBC RD M6	J		20.00		653.00	2.124	2.206	2.076	52	200	203	DWC	-244	520	0.60	OK	0.40	OK	-0.21	-0.210	-0.25	2.33	2.46	OK
837	SBC RD M6	WW4	J	L	45.00		53168.00	2.206	1.65	169.023	465	539	630	HDPE	81	900	0.88	OK	0.98	OK	-3.14	-3.140	-3.19	5.35	4.84	OK

As per Network Length
From KWA(10082+6148+17173)
Total

19765.00
19765.00
33403.00
53168.00

#REF!

SEWER NETWORK DESIGN - ELAMKULAM_ BLOCK 6

Sl. No.	Man Holes				Man hole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Che ck Velo city (0.6 m/s)	Fall m	Manhol e Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
										Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWH+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	From				To	Starting Manhole	Ending manhole			
1	4	5	6	7	8	9	10.00	11	12	13.000	14.000	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	
1	ABN RD M11	ABN RD M12	0	1	H		30		30.00	1.754	1.776	2.19	2.19	2.25	0.057	0.000	0.057	9	200	203	DWC	-1364	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.65		0.48	1.10	1.30	OK	
2	ABN RD M12	ABN RD M13	1	1	C		20		50.00	1.776	1.790	1.46	3.65	2.25	0.095	0.000	0.095	12	200	203	DWC	-1429	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.48		0.37	1.30	1.42	OK	
3	ABN RD M13	ABN RD M14	1	1	C		20		70.00	1.790	1.805	1.46	5.12	2.25	0.133	0.000	0.133	14	200	203	DWC	-1333	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.37		0.26	1.42	1.55	OK	
4	ABN RD M14	KPY RD M10	1	1	C		30		100.00	1.805	1.844	2.19	7.31	2.25	0.190	0.000	0.190	16	200	203	DWC	-769	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.26		0.09	1.55	1.75	OK	
5	KPY RD M12	KPY RD M11	0	1	H		28		28.00	2.011	2.365	2.05	2.05	2.25	0.053	0.000	0.053	9	200	203	DWC	-79	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	0.91		0.75	1.10	1.62	OK	
6	KPY RD M11	KPY RD M10	1	1	C		30		58.00	2.365	1.844	2.19	4.24	2.25	0.110	0.000	0.110	12	200	203	DWC	58	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.75		0.58	1.62	1.26	OK	
7	KPY RD M10.1	KPY RD M10	0	1	H		13		13.00	1.842	1.844	0.95	0.95	2.25	0.025	0.000	0.025	6	200	203	DWC	-6500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	0.74		0.67	1.10	1.17	OK	
8	KPY RD M10	KPY RD M9	3	1	J		11		182.00	1.844	1.707	0.80	13.30	2.25	0.346	0.000	0.346	22	200	203	DWC	80	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	0.09	0.09	0.03	1.75	1.68	OK	
9	KPY RD M9	KPY RD M8	1	1	C		28		210.00	1.707	1.580	2.05	15.35	2.25	0.400	0.000	0.400	23	200	203	DWC	220	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	0.03		-0.13	1.68	1.71	OK	
10	KPY RD M8	KPY RD M7	1	1	C		28		238.00	1.580	1.473	2.05	17.40	2.25	0.453	0.000	0.453	25	200	203	DWC	262	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	-0.13		-0.22	1.71	1.69	OK	
11	KPY RD M7	KPY RD M6	1	1	C		12		250.00	1.473	1.462	0.88	18.27	2.25	0.476	0.000	0.476	25	200	203	DWC	1091	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.04	0.00	-0.22		-0.26	1.69	1.72	OK	
12	KPY RD M6	KPY RD M5	1	1	C		18		268.00	1.462	1.533	1.32	19.59	2.25	0.510	0.000	0.510	26	200	203	DWC	-254	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	-0.26		-0.32	1.72	1.85	OK	
13	KPY RD M5	KPY RD M4	1	1	C		30		298.00	1.533	1.631	2.19	21.78	2.25	0.567	0.000	0.567	27	200	203	DWC	-306	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	-0.32		-0.41	1.85	2.04	OK	
14	KPY RD M4	KPY RD M3	1	1	C		9		307.00	1.631	1.592	0.66	22.44	2.25	0.584	0.000	0.584	28	200	203	DWC	231	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	-0.41		-0.44	2.04	2.03	OK	
15	KPY RD M3	KPY RD M2	1	1	C		26		333.00	1.592	1.571	1.90	24.34	2.25	0.634	0.000	0.634	29	200	203	DWC	1238	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	-0.44		-0.50	2.03	2.07	OK	
16	KPY RD M2	KPY RD M1	1	1	C		22		355.00	1.571	1.685	1.61	25.95	2.25	0.676	0.000	0.676	30	200	203	DWC	-193	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	-0.50		-0.54	2.07	2.23	OK	
17	KPY RD M1	CHR RD M71	1	1	C		30		385.00	1.685	1.802	2.19	28.14	2.25	0.733	0.000	0.733	31	200	203	DWC	-256	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	-0.54		-0.60	2.23	2.40	OK	
18	TBD RD M43	CHR RD M82	0	1	H		27		27.00	1.981	1.764	1.97	1.97	2.25	0.051	0.000	0.051	9	200	203	DWC	124	124	0.010	1.22	38.37	0.00	0.30	0.07	OK	0.37	OK	0.22	0.00	0.88		0.66	1.10	1.10	OK	
19	CHR RD M82	CHR RD M81	1	1	C		25		52.00	1.760	1.710	1.83	3.80	2.25	0.099	0.000	0.099	12	200	203	DWC	500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.66		0.52	1.10	1.19	OK	
20	CHR RD M81	CHR RD M80	1	1	C		25		77.00	1.706	1.801	1.83	5.63	2.25	0.147	0.000	0.147	14	200	203	DWC	-263	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.52		0.38	1.19	1.42	OK	
21	CHR RD M80.3	CHR RD M80.2	0	1	H		29		29.00	1.910	1.972	2.12	2.12	2.25	0.055	0.000	0.055	9	200	203	DWC	-468	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	0.81		0.65	1.10	1.32	OK	
22	CHR RD M80.2	CHR RD M80.1	1	1	C		20		49.00	1.972	1.980	1.46	3.58	2.25	0.093	0.000	0.093	11	200	203	DWC	-2500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.65		0.54	1.32	1.44	OK	
23	CHR RD M80.1	CHR RD M80	1	1	C		26		75.00	1.980	1.801	1.90	5.48	2.25	0.143	0.000	0.143	14	200	203	DWC	145	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.54		0.40	1.44	1.40	OK	
24	CHR RD M80	CHR RD M79	2	1	J		16		168.00	1.801	1.792	1.17	12.28	2.25	0.320	0.000	0.320	21	200	203	DWC	1778	180	0.010	1.01	31.84	0.01	0.30	0.07	OK											

Sl. No.	Man Holes								Ground Levels				FLOWS LPS				Proposed Size of Sewer in mm					As per Manning Table			At Ultimate peak flow								Invert Level in m			Depth of cutting in m		Check Depth of cutting	
	From	To		Man hole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Starting Manhole	Ending Manhole	DWF in cum/day	Cumalitive flow in cum/day	Peak Factor	Cum Peak Factor	GW+UAC	Total Flow	Require d dia.	ID	OD	MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Che ck Velo city (> 0.6 m/s)	Fall m	Manhol e Drop m	From	To	Starting Manhol e	Ending manhole		
67	CHR RD M70	CHR RD M69	1	1	C		22	1529.00	1.861	1.876	1.61	111.76	2.25	2.910	0.000	2.910	61	200	203	DWC	-1467	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.04	0.00	-0.65		-0.69	2.51	2.57	OK
68	CHR RD M69	CHR RD M68	1	1	C		22	1551.00	1.876	1.890	1.61	113.37	2.25	2.952	0.000	2.952	62	200	203	DWC	-1571	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.04	0.00	-0.69		-0.73	2.57	2.62	OK
69	CHR RD M68.12	CHR RD M68.11	0	1	H		24	24.00	2.053	2.152	1.75	1.75	2.25	0.046	0.000	0.046	8	200	203	DWC	-242	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	0.95		0.82	1.10	1.33	OK
70	CHR RD M68.11	CHR RD M68.10	1	1	C		18	42.00	2.152	1.844	1.32	3.07	2.25	0.080	0.000	0.080	11	200	203	DWC	58	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	0.82		0.72	1.33	1.12	OK
71	CHR RD M68.10	CHR RD M68.9	1	1	C		17	59.00	1.844	2.027	1.24	4.31	2.25	0.112	0.000	0.112	12	200	203	DWC	-93	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	0.72		0.63	1.12	1.40	OK
72	CHR RD M68.9	CHR RD M68.8	1	1	C		20	79.00	2.027	1.966	1.46	5.77	2.25	0.150	0.000	0.150	14	200	203	DWC	328	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.63		0.52	1.40	1.45	OK
73	CHR RD M68.8	CHR RD M68.7	1	1	C		30	109.00	1.966	1.644	2.19	7.97	2.25	0.207	0.000	0.207	17	200	203	DWC	93	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.52		0.35	1.45	1.29	OK
74	CHR RD M68.7	CHR RD M68.6	1	1	C		12	121.00	1.644	1.679	0.88	8.84	2.25	0.230	0.000	0.230	18	200	203	DWC	-343	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	0.35		0.28	1.29	1.40	OK
75	CHR RD M68.6	CHR RD M68.5	1	1	C		24	145.00	1.679	1.610	1.75	10.60	2.25	0.276	0.000	0.276	19	200	203	DWC	348	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	0.28		0.15	1.40	1.46	OK
76	CHR RD M68.5	CHR RD M68.4	1	1	C		24	169.00	1.610	1.597	1.75	12.35	2.25	0.322	0.000	0.322	21	200	203	DWC	1846	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	0.15		0.02	1.46	1.58	OK
77	CHR RD M68.4.2.4	CHR RD M68.4.2.3	0	1	H		16	16.00	2.384	2.600	1.17	1.17	2.25	0.030	0.000	0.030	7	200	203	DWC	-74	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	1.28		1.19	1.10	1.41	OK
78	CHR RD M68.4.2.3	CHR RD M68.4.2.2	1	1	C		16	32.00	2.600	2.201	1.17	2.34	2.25	0.061	0.000	0.061	9	200	203	DWC	40	165	0.010	1.06	33.26	0.00	0.30	0.07	OK	0.32	OK	0.10	0.00	1.19		1.09	1.41	1.11	OK
79	CHR RD M68.4.2.2	CHR RD M68.4.2.1	1	1	C		18	50.00	2.201	1.807	1.32	3.65	2.25	0.095	0.000	0.095	12	200	203	DWC	54	54	0.010	1.85	58.14	0.00	0.30	0.07	OK	0.55	OK	0.33	0.00	1.09		0.76	1.11	1.11	OK
80	CHR RD M68.4.2.1	CHR RD M68.4.2	1	1	C		18	68.00	1.867	1.724	1.32	4.97	2.25	0.129	0.000	0.129	13	200	203	DWC	126	130	0.010	1.19	37.47	0.00	0.30	0.07	OK	0.36	OK	0.14	0.00	0.76		0.62	1.11	1.10	OK
81	CHR RD M68.4.2	CHR RD M68.4.3	0	1	H		18	18.00	1.510	1.568	1.32	1.32	2.25	0.034	0.000	0.034	7	200	203	DWC	-310	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	0.41		0.31	1.10	1.26	OK
82	CHR RD M68.4.3.2	CHR RD M68.4.3.1	0	1	H		21	21.00	1.784	1.686	1.53	1.53	2.25	0.040	0.000	0.040	8	200	203	DWC	214	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	0.68		0.56	1.10	1.13	OK
83	CHR RD M68.4.3.1	CHR RD M68.4.3	1	1	C		20	41.00	1.686	1.568	1.46	3.00	2.25	0.078	0.000	0.078	10	200	203	DWC	169	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.56			1.13	1.12	OK
84	CHR RD M68.4.3	CHR RD M68.4.2	2	1	J		11	70.00	1.568	1.724	0.80	5.12	2.25	0.133	0.000	0.133	14	200	203	DWC	-71	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	0.45	0.45	0.39	1.12	1.33	OK
85	CHR RD M68.4.2	CHR RD M68.4.1	2	1	J		30	168.00	1.724	1.824	2.19	12.28	2.25	0.320	0.000	0.320	21	200	203	DWC	-300	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.39	0.39	0.22	1.33	1.60	OK
86	CHR RD M68.4.1	CHR RD M68.4	1	1	C		30	198.00	1.824	1.597	2.19	14.47	2.25	0.377	0.000	0.377	22	200	203	DWC	132	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.22		0.05	1.60	1.55	OK
87	CHR RD M68.4	CHR RD M68.3	2	1	J		32	399.00	1.597	1.670	2.34	29.16	2.25	0.759	0.000	0.759	32	200	203	DWC	-438	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.02	0.02	-0.04	1.58	1.71	OK
88	CHR RD M68.3	CHR RD M68.2	1	1	C		31	430.00	1.670	1.743	2.27	31.43	2.25	0.819	0.000	0.819	33	200	203	DWC	-425	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	-0.04		-0.10	1.71	1.84	OK
89	CHR RD M68.2.7	CHR RD M68.2.6	0	1	H		31	31.00	2.114	1.568	2.27	2.27	2.25	0.059	0.000	0.059	9	200	203	DWC	57	57	0.010	1.81	56.84	0.00	0.30	0.07	OK	0.54	OK	0.55	0.00	1.01		0.46	1.10	1.11	OK
90	CHR RD M68.2.6	CHR RD M68.2.5	1	1	C		31	62.00	1.568	1.552	2.27	4.53	2.25	0.118	0.000	0.118	13	200	203	DWC	1938	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.46		0.29	1.11	1.26	OK
91	CHR RD M68.2.5	CHR RD M68.2.4	1	1	C		31	93.00	1.552	1.629	2.27	6.80	2.25	0.177	0.000	0.177	16	200	203	DWC	-403	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.29		0.12	1.26	1.51	OK
92	CHR RD M68.2.4	CHR RD M68.2.3	1	1	C		31	124.00	1.624	1.706	2.27	9.06	2.25	0.236	0.000	0.236	18	200	203	DWC	-378	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.12		-0.05	1.50	1.76	OK
93	CHR RD M68.2.3	CHR RD M68.2.2	1	1	C		8	132.00	1.706	1.715	0.58	9.65	2.25	0.251	0.000	0.251	18	200	203	DWC	-889	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.04	0.00	-0.05		-0.09	1.76	1.81	OK
94	CHR RD M68.2.2	CHR RD M68.2.1	1	1	C		20	152.00	1.715	1.724	1.46	11.11	2.25	0.289	0.000	0.289	20	200	203	DWC	-2222	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	-0.09		-0.20	1.81	1.92	OK
95	CHR RD M68.2.1	CHR RD M68.2	1	1	C		20	172.00	1.724	1.743	1.46	12.57	2.25	0.327	0.000	0.327	21	200	203	DWC	-1053	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	-0.20		-0.31	1.92	2.05	OK
96	CHR RD M68.2	CHR RD M68.1	2	1	J		30	632.00	1.743	1.814	2.19	46.20	2.25	1.203	0.000	1.203	40	200	203	DWC	-423	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	-0.31	-0.31	-0.37	2.05	2.18	OK
97	CHR RD M68.1	CHR RD M68	1	1	C		28	660.00	1.814	1.890	2.05	48.24	2.25	1.256	0.000	1.256	41	200	203	DWC	-368	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.05	0.00	-0.37		-0.42	2.18	2.31	OK
98	CHR RD M68	CHR RD M67	2	1	J		20	2231.00	1.890	1.907	1.46	163.07	2.25	4.247	0.000	4.247	74	200	203	DWC	-1176	520	0.010	0.60	18.73	0.23	0.81	0.33	OK	0.48	OK	0.04	0.00	-0.73	-0.73	-0.77	2.62	2.68	OK
99	CHR RD M67	CHR RD M66	1	1	C		25	2256.00	1.907	1.899	1.83	164.90	2.25	4.294	0.000	4.294	74	200	203	DWC	3125	520	0.010	0.60	18.73	0.23	0.81	0.33	OK	0.48	OK	0.05	0.00	-0.77		-0.82	2.68	2.72	OK
100	CHR RD M66	CHR RD M65	1	1	C		25	2281.00	1.899	1.958	1.83	166.73	2.25	4.342	0.000	4.342	75	200	203	DWC	-424	520	0.010	0.60	18.73	0.23	0.81	0.33	OK	0.48	OK	0.05	0.00	-0.82		-0.87	2.72	2.83	OK
101	CHR RD M65.2	CHR RD M65.1	0	1	H		14	14.00	1.994	1.985	1.02	1.02																											

Sl. No.	Man Holes								Ground Levels				FLOWS LPS				Proposed Size of Sewer in mm					As per Manning Table			At Ultimate peak flow								Invert Level in m			Depth of cutting in m		Check Depth of cutting	
	From	To		Man hole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Starting Manhole	Ending Manhole	DWF in cum/day	Cumulative flow in cum/day	Peak Factor	Cum Peak Factor	GW+UAC	Total Flow	Required dia.	ID	OD	MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	Manning's n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6 m/s)	Fall m	Manhole Drop m	From	To	Starting Manhole	Ending manhole		
136	GW RD M6.3	GW RD M6.2	1	1	C		30	40.00	1.534	1.635	2.19	2.92	2.25	0.076	0.000	0.076	10	200	203	DWC	-297	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.34		0.17	1.19	1.47	OK
137	GW RD M6.2	GW RD M6.1	1	1	C		17	57.00	1.635	1.787	1.24	4.17	2.25	0.108	0.000	0.108	12	200	203	DWC	-112	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	0.17		0.08	1.47	1.71	OK
138	GW RD M6.1	GW RD M6	1	1	C		26	83.00	1.787	1.725	1.90	6.07	2.25	0.158	0.000	0.158	15	200	203	DWC	419	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.08		-0.06	1.71	1.79	OK
139	GW RD M12	GW RD M11	0	1	H		26	26.00	1.570	1.554	1.90	1.90	2.25	0.049	0.000	0.049	8	200	203	DWC	1625	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.47		0.33	1.10	1.22	OK
140	GW RD M11	GW RD M10	1	1	C		6	32.00	1.554	1.554	0.44	2.34	2.25	0.061	0.000	0.061	9	200	203	DWC	0	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.03	0.00	0.33		0.30	1.22	1.25	OK
141	GW RD M10.2	GW RD M10.1	0	1	H		20	20.00	1.584	1.582	1.46	1.46	2.25	0.038	0.000	0.038	7	200	203	DWC	10000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.48		0.37	1.10	1.21	OK
142	GW RD M10.1	GW RD M10	1	1	C		20	40.00	1.582	1.580	1.46	2.92	2.25	0.076	0.000	0.076	10	200	203	DWC	10000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.37		0.26	1.21	1.32	OK
143	GW RD M10	GW RD M9	2	1	J		32	104.00	1.580	1.716	2.34	7.60	2.25	0.198	0.000	0.198	16	200	203	DWC	-235	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	0.26	0.26	0.08	1.32	1.64	OK
144	GW RD M9	GW RD M8	1	1	C		16	120.00	1.716	1.709	1.17	8.77	2.25	0.228	0.000	0.228	18	200	203	DWC	2286	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	0.08		-0.01	1.64	1.72	OK
145	GW RD M8	GW RD M7	1	1	C		22	142.00	1.710	1.707	1.61	10.38	2.25	0.270	0.000	0.270	19	200	203	DWC	7333	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	-0.01		-0.13	1.72	1.84	OK
146	GW RD M7.1	GW RD M7	0	1	H		27	27.00	1.470	1.707	1.97	1.97	2.25	0.051	0.000	0.051	9	200	203	DWC	-114	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	0.37		0.22	1.10	1.49	OK
147	GW RD M7	GW RD M6	2	1	J		22	191.00	1.707	1.714	1.61	13.96	2.25	0.364	0.000	0.364	22	200	203	DWC	-3143	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	-0.13	-0.13	-0.25	1.84	1.96	OK
148	GW RD M6	GW RD M5	2	1	J		9	283.00	1.714	1.724	0.66	20.69	2.25	0.539	0.000	0.539	27	200	203	DWC	-900	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.02	0.00	-0.25	-0.25	-0.27	1.96	1.99	OK
149	GW RD M5	GW RD M4	1	1	C		26	309.00	1.724	1.900	1.90	22.59	2.25	0.588	0.000	0.588	28	200	203	DWC	-148	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	-0.27		-0.33	1.99	2.23	OK
150	GW RD M4	GW RD M3	1	1	C		19	328.00	1.900	1.982	1.39	23.97	2.25	0.624	0.000	0.624	29	200	203	DWC	-232	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	-0.33		-0.38	2.23	2.36	OK
151	GW RD M3.2	GW RD M3.1	0	1	H		13	13.00	1.811	2.010	0.95	0.95	2.25	0.025	0.000	0.025	6	200	203	DWC	-65	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	0.71		0.64	1.10	1.37	OK
152	GW RD M3.1	GW RD M3	1	1	C		11	24.00	2.010	1.982	0.80	1.75	2.25	0.046	0.000	0.046	8	200	203	DWC	393	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	0.64		0.58	1.37	1.40	OK
153	GW RD M3	GW RD M2	2	1	J		5	357.00	1.982	1.975	0.37	26.09	2.25	0.680	0.000	0.680	30	200	203	DWC	714	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.01	0.00	-0.38	-0.38	-0.39	2.36	2.37	OK
154	GW RD M2	GW RD M1	1	1	C		25	382.00	1.975	1.989	1.83	27.92	2.25	0.727	0.000	0.727	31	200	203	DWC	-1786	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	-0.39		-0.44	2.37	2.43	OK
155	GW RD M1	CHR RD M59	1	1	C		25	407.00	1.989	1.723	1.83	29.75	2.25	0.775	0.000	0.775	32	200	203	DWC	94	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	-0.44		-0.49	2.43	2.21	OK
156	CHR RD M59	CHR RD M58	2	1	J		19	3553.00	1.723	1.783	1.39	259.70	2.25	6.763	0.000	6.763	93	200	203	DWC	-317	520	0.010	0.60	18.73	0.36	0.92	0.42	OK	0.55	OK	0.04	0.00	-1.14	-1.14	-1.18	2.86	2.96	OK
157	CHR RD M58	CHR RD M57	1	1	C		30	3583.00	1.783	1.854	2.19	261.90	2.25	6.820	0.000	6.820	94	200	203	DWC	-423	520	0.010	0.60	18.73	0.36	0.92	0.42	OK	0.55	OK	0.06	0.00	-1.18		-1.24	2.96	3.09	OK
158	CHR RD M57	CHR RD M56	1	1	C		8	3610.00	1.854	1.858	1.97	263.87	2.25	6.872	0.000	6.872	94	200	203	DWC	-6750	520	0.010	0.60	18.73	0.37	0.93	0.43	OK	0.55	OK	0.05	0.00	-1.24		-1.29	3.09	3.15	OK
159	CHR RD M56	CHR RD M55	1	1	C		8	3618.00	1.858	1.859	0.58	264.46	2.25	6.887	0.000	6.887	94	200	203	DWC	-8000	520	0.010	0.60	18.73	0.37	0.93	0.43	OK	0.55	OK	0.02	0.00	-1.29		-1.31	3.15	3.17	OK
160	KPH RD M2	KPH RD M1	0	1	H		27	27.00	1.943	1.997	1.97	1.97	2.25	0.051	0.000	0.051	9	200	203	DWC	-500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	0.84		0.69	1.10	1.31	OK
161	KPH RD M1	CHR RD M55	1	1	C		30	57.00	1.997	1.859	2.19	4.17	2.25	0.108	0.000	0.108	12	200	203	DWC	217	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.69		0.52	1.31	1.34	OK
162	CHR RD M55	CHR RD M54	2	1	J		16	3691.00	1.859	1.862	1.17	269.79	2.25	7.026	0.000	7.026	95	200	203	DWC	-5333	520	0.010	0.60	18.73	0.38	0.93	0.43	OK	0.55	OK	0.03	0.00	-1.31	-1.31	-1.34	3.17	3.20	OK
163	CHR RD M54.2	CHR RD M54.1	0	1	H		20	20.00	1.800	1.823	1.46	1.46	2.25	0.038	0.000	0.038	7	200	203	DWC	-870	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.70		0.59	1.10	1.23	OK
164	CHR RD M54.1	CHR RD M54	1	1	C		30	50.00	1.823	1.862	2.19	3.65	2.25	0.095	0.000	0.095	12	200	203	DWC	-769	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.59		0.42	1.23	1.44	OK
165	CHR RD M54	CHR RD M53	2	1	J		21	3762.00	1.862	1.866	1.53	274.98	2.25	7.161	0.000	7.161	96	200	203	DWC	-5250	520	0.010	0.60	18.73	0.38	0.93	0.43	OK	0.55	OK	0.04	0.00	-1.34	-1.34	-1.38	3.20	3.25	OK
166	SW RD M2	SW RD M1	0	1	H		30	30.00	2.140	2.027	2.19	2.19	2.25	0.057	0.000	0.057	9	200	203	DWC	265	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.04		0.87	1.10	1.16	OK
167	SW RD M1	CHR RD M53	1	1	C		30	60.00	2.027	1.866	2.19	4.39	2.25	0.114	0.000	0.114	13	200	203	DWC	186	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.87		0.70	1.16	1.17	OK
168	CHR RD M53	CHR RD M52	2	1	J		31	3853.00	1.866	1.740	2.27	281.63	2.25	7.334	0.000	7.334	97	200	203	DWC	246	520	0.010	0.60	18.73	0.39	0.94	0.44	OK	0.56	OK	0.06	0.00	-1.38	-1.38	-1.44	3.25	3.18	OK
169	CHR RD M52.2	CHR RD M52.1	0	1	H		28	28.00	1.984	1.946	2.05	2.05	2.25	0.053	0.000	0.053	9	200	203	DWC	737	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	0.88		0.72	1.10	1.23	OK
170	CHR RD M52.1	CHR RD M52	1	1	C		30	58.00	1.946	1.740	2.19	4.24	2.25	0.110	0.000	0.110	12	200	203	DWC	146	180	0.010	1.01	31.84	0.													

Sl. No.	Man Holes								Ground Levels				FLOWS LPS				Proposed Size of Sewer in mm					As per Manning Table			At Ultimate peak flow								Invert Level in m			Depth of cutting in m		Check Depth of cutting	
	From	To		Man hole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Starting Manhole	Ending Manhole	DWF in cum/day	Cumalitive flow in cum/day	Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow	Required dia.	ID	OD	MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6 m/s)	Fall m	Manhole Drop m	From		To	Starting Manhole	Ending manhole	
205	TEE RD M7	TEE RD M6	1	1	C		26	40.00	1.724	1.824	1.90	2.92	2.25	0.076	0.000	0.076	10	200	203	DWC	-260	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.49		0.35	1.23	1.47	OK
206	TEE RD M6	TEE RD M5	1	1	C		23	63.00	1.824	2.060	1.68	4.60	2.25	0.120	0.000	0.120	13	200	203	DWC	-97	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	0.35		0.22	1.47	1.84	OK
207	TEE RD M5.1	TEE RD M5	0	1	H		8	8.00	2.063	2.060	0.58	0.58	2.25	0.015	0.000	0.015	5	200	203	DWC	2667	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	0.96		0.92	1.10	1.14	OK
208	TEE RD M5	TEE RD M4	2	1	J		16	87.00	2.060	1.894	1.17	6.36	2.25	0.166	0.000	0.166	15	200	203	DWC	96	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	0.22	0.22	0.13	1.84	1.76	OK
209	TEE RD M4	TEE RD M3	1	1	C		30	117.00	1.894	1.846	2.19	8.55	2.25	0.223	0.000	0.223	17	200	203	DWC	625	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.13		-0.04	1.76	1.89	OK
210	TEE RD M3	CHR RD M46	1	1	C		30	147.00	1.846	1.848	2.19	10.74	2.25	0.280	0.000	0.280	19	200	203	DWC	-15000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.04		-0.21	1.89	2.06	OK
211	CHR RD M46	CHR RD M45	2	1	J		8	4720.00	1.850	1.865	0.58	345.01	2.25	8.985	0.000	8.985	107	200	203	DWC	-533	520	0.010	0.60	18.73	0.48	0.99	0.49	OK	0.59	OK	0.02	0.00	-1.86	-1.86	-1.88	3.71	3.75	OK
212	CV RD M3	CV RD M2	0	1	H		20	20.00	2.060	2.057	1.46	1.46	2.25	0.038	0.000	0.038	7	200	203	DWC	6667	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.96		0.85	1.10	1.21	OK
213	CV RD M2	CV RD M1	1	1	C		23	43.00	2.057	2.038	1.68	3.14	2.25	0.082	0.000	0.082	11	200	203	DWC	1211	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	0.85		0.72	1.21	1.32	OK
214	CV RD M1	CHR RD M45	1	1	C		22	65.00	2.038	1.865	1.61	4.75	2.25	0.124	0.000	0.124	13	200	203	DWC	127	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	0.72		0.60	1.32	1.27	OK
215	CHR RD M45	CHR RD M44	2	1	J		10	4795.00	1.865	1.759	0.73	350.49	2.25	9.127	0.000	9.127	108	200	203	DWC	94	520	0.010	0.60	18.73	0.49	0.99	0.49	OK	0.59	OK	0.02	0.00	-1.88	-1.88	-1.90	3.75	3.66	OK
216	CHR RD M44	CHR RD M43	1	1	C		23	4818.00	1.759	1.719	1.68	352.17	2.25	9.171	0.000	9.171	109	200	203	DWC	575	180	0.010	1.01	31.84	0.29	0.87	0.38	OK	0.88	OK	0.13	0.00	-1.90		-2.03	3.66	3.75	OK
217	TEE RD M2	TEE RD M1	0	1	H		28	28.00	1.820	1.770	2.05	2.05	2.25	0.053	0.000	0.053	9	200	203	DWC	560	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	0.72		0.56	1.10	1.21	OK
218	TEE RD M1	CHR RD M43	1	1	C		30	58.00	1.770	1.719	2.19	4.24	2.25	0.110	0.000	0.110	12	200	203	DWC	588	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.56		0.39	1.21	1.33	OK
219	CHR RD M43	CHR RD M42	2	1	J		15	4891.00	1.719	1.780	1.10	357.50	2.25	9.310	0.000	9.310	109	200	203	DWC	-246	520	0.010	0.60	18.73	0.50	1.00	0.50	OK	0.60	OK	0.03	0.00	-2.03	-2.03	-2.06	3.75	3.84	OK
220	CHR RD M42.3	CHR RD M42.2	0	1	H		30	30.00	2.042	2.049	2.19	2.19	2.25	0.057	0.000	0.057	9	200	203	DWC	-4286	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.94		0.77	1.10	1.28	OK
221	CHR RD M42.2	CHR RD M42.1	1	1	C		30	60.00	2.049	1.916	2.19	4.39	2.25	0.114	0.000	0.114	13	200	203	DWC	226	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.77		0.60	1.28	1.32	OK
222	CHR RD M42.1	CHR RD M42	1	1	C		21	81.00	1.916	1.780	1.53	5.92	2.25	0.154	0.000	0.154	15	200	203	DWC	154	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	0.60		0.48	1.32	1.30	OK
223	CHR RD M42	CHR RD M41	2	1	J		10	4982.00	1.780	1.768	0.73	364.16	2.25	9.483	0.000	9.483	110	200	203	DWC	833	520	0.010	0.60	18.73	0.51	1.01	0.51	OK	0.60	OK	0.02	0.00	-2.06	-2.06	-2.08	3.84	3.85	OK
224	CHR RD M41	CHR RD M40	1	1	C		27	5009.00	1.768	1.894	1.97	366.13	2.25	9.535	0.000	9.535	111	200	203	DWC	-214	520	0.010	0.60	18.73	0.51	1.01	0.51	OK	0.60	OK	0.05	0.00	-2.08		-2.13	3.85	4.02	OK
225	CHR RD M40.8	CHR RD M40.7	0	1	H		31	31.00	1.842	1.853	2.27	2.27	2.25	0.059	0.000	0.059	9	200	203	DWC	-2818	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.74		0.57	1.10	1.28	OK
226	CHR RD M40.7	CHR RD M40.6	1	1	C		31	62.00	1.853	1.864	2.27	4.53	2.25	0.118	0.000	0.118	13	200	203	DWC	-2818	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.57		0.40	1.28	1.46	OK
227	CHR RD M40.6	CHR RD M40.5	1	1	C		14	76.00	1.864	1.869	1.02	5.56	2.25	0.145	0.000	0.145	14	200	203	DWC	-2800	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.40		0.32	1.46	1.55	OK
228	CHR RD M40.5	CHR RD M40.4	1	1	C		26	102.00	1.869	1.874	1.90	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	-5200	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	0.32		0.18	1.55	1.69	OK
229	CHR RD M40.4	CHR RD M40.3	1	1	C		21	123.00	1.874	2.057	1.53	8.99	2.25	0.234	0.000	0.234	18	200	203	DWC	-115	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	0.18		0.06	1.69	2.00	OK
230	CHR RD M40.3	CHR RD M40.2	1	1	C		25	148.00	2.060	2.033	1.83	10.82	2.25	0.282	0.000	0.282	19	200	203	DWC	926	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	0.06		-0.08	2.00	2.11	OK
231	CHR RD M40.2	CHR RD M40.1	1	1	C		25	173.00	2.033	1.941	1.83	12.65	2.25	0.329	0.000	0.329	21	200	203	DWC	272	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	-0.08		-0.22	2.11	2.16	OK
232	CHR RD M40.1	CHR RD M40	1	1	C		25	198.00	1.941	1.894	1.83	14.47	2.25	0.377	0.000	0.377	22	200	203	DWC	532	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	-0.22		-0.36	2.16	2.25	OK
233	CHR RD M40	CHR RD M39	2	1	J		8	5215.00	1.894	1.800	0.58	381.19	2.25	9.927	0.000	9.927	113	200	203	DWC	85	520	0.010	0.60	18.73	0.53	1.02	0.52	OK	0.61	OK	0.02	0.00	-2.13	-2.13	-2.15	4.02	3.95	OK
234	CHR RD M39.2	CHR RD M39.1	0	1	H		18	18.00	1.840	1.817	1.32	1.32	2.25	0.034	0.000	0.034	7	200	203	DWC	783	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	0.74		0.64	1.10	1.18	OK
235	CHR RD M39.1	CHR RD M39	1	1	C		25	43.00	1.817	1.800	1.83	3.14	2.25	0.082	0.000	0.082	11	200	203	DWC	1471	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.64		0.50	1.18	1.30	OK
236	CHR RD M39	CHR RD M38	2	1	J		29	5287.00	1.800	1.860	2.12	386.45	2.25	10.064	0.000	10.064	114	200	203	DWC	-483	520	0.010	0.60	18.73	0.54	1.02	0.53	OK	0.61	OK	0.06	0.00	-2.15	-2.15	-2.21	3.95	4.07	OK
237	WH RD M5	WH RD M4	0	1	H		30	30.00	1.750	1.752	2.19	2.19	2.25	0.057	0.000	0.057	9	200	203	DWC	-15000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.65		0.48	1.10	1.27	OK
238	WH RD M4	WH RD M3	1	1	C		23	53.00	1.752	1.915	1.68	3.87	2.25	0.101	0.000	0.101	12	200	203	DWC	-141	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	0.48		0.35	1.27	1.57	OK
239	WH RD M3	WH RD M2	1	1	C		27	80.00	1.915	1.904	1.97	5.85	2.25	0.152	0.000	0.152	14	200	203	DWC	2455	18																	

Sl. No.	Man Holes								Ground Levels						FLOWS LPS					Proposed Size of Sewer in mm					As per Manning Table			At Ultimate peak flow								Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To		Man hole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Starting Manhole	Ending Manhole	DWF in cum/day	Cumalitive flow in cum/day	Peak Factor	Cum Peak Factor	GW+UAC	Total Flow	Required dia.	ID	OD	MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6 m/s)	Fall m	Manhole Drop m	From	To	Starting Manhole	Ending manhole				
274	SSS RD M3	SSS RD M2	1	1	C		15	237.00	1.761	1.854	1.10	17.32	2.25	0.451	0.000	0.451	24	200	203	DWC	-161	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	-0.21		-0.29	1.97	2.14	OK		
275	SSS RD M2	SSS RD M1	1	1	C		9	246.00	1.854	1.905	0.66	17.98	2.25	0.468	0.000	0.468	25	200	203	DWC	-176	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.05	0.00	-0.29		-0.34	2.14	2.25	OK		
276	SSS RD M1	CHR RD M34	1	1	C		14	260.00	1.905	1.865	1.02	19.00	2.25	0.495	0.000	0.495	26	200	203	DWC	350	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.04	0.00	-0.34		-0.38	2.25	2.25	OK		
277	CHR RD M34	CHR RD M32	2	1	J		30	6225.00	1.865	2.330	2.19	455.01	2.25	11.849	0.000	11.849	123	200	203	DWC	-65	520	0.010	0.60	18.73	0.63	1.05	0.58	OK	0.62	OK	0.06	0.00	-2.37	-2.37	-2.43	4.24	4.76	OK		
278	CHR RD M32	CHR RD M31	1	1	C		39	6264.00	2.330	1.767	2.85	457.86	2.25	11.849	0.000	11.924	124	200	203	DWC	69	520	0.010	0.60	18.73	0.64	1.06	0.59	OK	0.63	OK	0.08	0.00	-2.43		-2.51	4.76	4.28	OK		
279	CHR RD M31.2	CHR RD M31.1	0	1	H		20	20.00	1.790	1.804	1.46	1.46	2.25	0.038	0.000	0.038	7	200	203	DWC	-1429	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.69		0.58	1.10	1.22	OK		
280	CHR RD M31.1	CHR RD M31	1	1	C		30	50.00	1.804	1.767	2.19	3.65	2.25	0.095	0.000	0.095	12	200	203	DWC	811	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.58		0.41	1.22	1.36	OK		
281	CHR RD M31.5	CHR RD M31.4	0	1	H		10	10.00	2.710	2.515	0.73	0.73	2.25	0.019	0.000	0.019	5	200	203	DWC	51	51	0.010	1.90	59.82	0.00	0.30	0.07	OK	0.57	OK	0.20	0.00	1.61		1.41	1.10	1.11	OK		
282	CHR RD M31.4	CHR RD M31.3	1	1	C		25	35.00	2.515	2.027	1.83	2.56	2.25	0.067	0.000	0.067	10	200	203	DWC	51	51	0.010	1.90	59.82	0.00	0.30	0.07	OK	0.57	OK	0.49	0.00	1.41		0.92	1.11	1.11	OK		
283	CHR RD M31.3	CHR RD M31	1	1	C		30	65.00	2.027	1.767	2.19	4.75	2.25	0.124	0.000	0.124	13	200	203	DWC	115	115	0.010	1.27	39.84	0.00	0.30	0.07	OK	0.38	OK	0.26	0.00	0.92		0.66	1.11	1.11	OK		
284	CHR RD M31	CHR RD M30	3	1	J		13	6392.00	1.767	1.773	0.95	467.22	2.25	12.167	0.000	12.167	125	200	203	DWC	-2167	520	0.010	0.60	18.73	0.65	1.06	0.59	OK	0.63	OK	0.03	0.00	-2.51	-2.51	-2.54	4.28	4.31	OK		
285	CHR RD M30	CHR RD M29	1	1	C		24	6416.00	1.773	1.779	1.75	468.97	2.25	12.213	0.000	12.213	125	200	203	DWC	-4000	520	0.010	0.60	18.73	0.65	1.06	0.59	OK	0.63	OK	0.05	0.00	-2.54		-2.59	4.31	4.37	OK		
286	CHR RD M29	CHR RD M28	1	1	C		30	6446.00	1.779	1.791	2.19	471.17	2.25	12.270	0.000	12.270	126	200	203	DWC	-2500	520	0.010	0.60	18.73	0.65	1.06	0.59	OK	0.63	OK	0.06	0.00	-2.59		-2.65	4.37	4.44	OK		
287	CHR RD M28.2	CHR RD M28.1	0	1	H		22	22.00	1.780	1.807	1.61	1.61	2.25	0.042	0.000	0.042	8	200	203	DWC	-815	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	0.68		0.56	1.10	1.25	OK		
288	CHR RD M28.1	CHR RD M28	1	1	C		20	42.00	1.807	1.791	1.46	3.07	2.25	0.080	0.000	0.080	11	200	203	DWC	1250	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.56		0.45	1.25	1.34	OK		
289	CHR RD M28	CHR RD M27	2	0	J	L		6518.00	1.791	1.802	2.19	476.43	2.25	12.407	0.000	12.407	126	200	203	DWC	-2727	520	0.010	0.60	18.73	0.66	1.07	0.60	OK	0.64	OK	0.06	0.00	-2.65	-2.65	-2.71	4.44	4.51	OK		
290	CHR RD M27L	CHR RD M26	0	1	H		21	6518.00	1.802	2.012	1.53	477.96	2.25	12.447	0.000	12.447	126	200	203	DWC	-100	180	0.010	1.01	31.84	0.39	0.94	0.44	OK	0.95	OK	0.12	0.00	0.70		0.58	1.10	1.43	OK		
291	TS RD M2	TS RD M1	0	1	H		24	24.00	2.012	2.080	1.75	1.75	2.25	0.046	0.000	0.046	8	200	203	DWC	-353	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	0.91		0.78	1.10	1.30	OK		
292	TS RD M1	CHR RD M26	1	1	C		30	54.00	2.080	2.012	2.19	3.95	2.25	0.103	0.000	0.103	12	200	203	DWC	441	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.78		0.61	1.30	1.40	OK		
293	TL RD M3	CHR RD M26	0	1	H		30	30.00	1.980	2.012	2.19	2.19	2.25	0.057	0.000	0.057	9	200	203	DWC	-937	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.88		0.71	1.10	1.30	OK		
294	CHR RD M26	CHR RD M25	3	1	J		16	6639.00	2.012	1.996	1.17	485.27	2.25	12.637	0.000	12.637	127	200	203	DWC	1000	520	0.010	0.60	18.73	0.67	1.07	0.60	OK	0.64	OK	0.03	0.00	0.58	0.58	0.55	1.43	1.45	OK		
295	CHR RD M25	CHR RD M24	1	1	C		20	6659.00	1.996	1.950	1.46	486.74	2.25	12.675	0.000	12.675	128	200	203	DWC	435	520	0.010	0.60	18.73	0.68	1.07	0.61	OK	0.64	OK	0.04	0.00	0.55		0.51	1.45	1.44	OK		
296	CHR RD M24	CHR RD M23	1	1	C		20	6679.00	1.950	1.920	1.46	488.20	2.25	12.713	0.000	12.713	128	200	203	DWC	667	520	0.010	0.60	18.73	0.68	1.07	0.61	OK	0.64	OK	0.04	0.00	0.51		0.47	1.44	1.45	OK		
297	CHR RD M23	CHR RD M22	1	1	C		20	6699.00	1.918	1.886	1.46	489.66	2.25	12.752	0.000	12.752	128	200	203	DWC	625	520	0.010	0.60	18.73	0.68	1.07	0.61	OK	0.64	OK	0.04	0.00	0.47		0.43	1.45	1.46	OK		
298	CHR RD M22.3	CHR RD M22.2	0	1	H		12	12.00	1.870	1.918	0.88	0.88	2.25	0.023	0.000	0.023	6	200	203	DWC	-250	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	0.77		0.70	1.10	1.22	OK		
299	CHR RD M22.2	CHR RD M22.1	1	1	C		30	42.00	1.918	1.982	2.19	3.07	2.25	0.080	0.000	0.080	11	200	203	DWC	-469	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.70		0.53	1.22	1.45	OK		
300	CHR RD M22.1	CHR RD M22	1	1	C		21	63.00	1.982	1.886	1.53	4.60	2.25	0.120	0.000	0.120	13	200	203	DWC	219	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	0.53		0.41	1.45	1.48	OK		
301	CHR RD M22.5	CHR RD M22.4	0	1	H		17	17.00	2.283	1.962	1.24	1.24	2.25	0.032	0.000	0.032	7	200	203	DWC	53	53	0.010	1.86	58.68	0.00	0.30	0.07	OK	0.56	OK	0.32	0.00	1.18		0.86	1.10	1.10	OK		
302	CHR RD M22.4	CHR RD M22	1	1	C		17	34.00	1.962	1.886	1.24	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	224	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	0.86		0.77	1.10	1.12	OK		
303	CHR RD M22	CHR RD M21	3	1	J		20	6816.00	1.886	1.896	1.46	498.21	2.25	12.974	0.000	12.974	129	200	203	DWC	-2000	520	0.010	0.60	18.73	0.69	1.08	0.61	OK	0.64	OK	0.04	0.00	0.41	0.41	0.37	1.48	1.53	OK		
304	CHR RD M21	CHR RD M20	0	1	C		27	6843.00	1.896	1.906	1.97	500.19	2.25	13.026	0.000	13.026	129	200	203	DWC	-2700	520	0.010	0.60	18.73	0.70	1.08	0.62	OK	0.64	OK	0.05	0.00	0.37		0.32	1.53	1.59	OK		
305	PT RD M2.3	PT RD M2.2	0	1	H		26	26.00	2.320	2.247	1.90	1.90	2.25	0.049	0.000	0.049	8	200	203	DWC	356	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	1.22		1.08	1.10	1.17	OK		
306	PT RD M2.2	PT RD M2.1	1	1	C		30	56.00	2.247	2.222	2.19	4.09	2.25	0.107	0.000	0.107	12	200	203	DWC	1200	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.08		0.91	1.17	1.31	OK		
307	PT RD M2.1	PT RD M2	1	1	C		30	86.00	2.222	2.162	2.19	6.29	2.25	0.164	0.000	0.164	15	200	203	DWC	500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.91		0.74	1.31	1.42	OK		
308	PT RD M2	PT RD M1	1	1	C		17	103.00	2.162	2.114	1.24	7.53	2.25	0.196	0.0																										

Sl. No.	Man Holes								Ground Levels						FLOWS LPS					Proposed Size of Sewer in mm					As per Manning Table			At Ultimate peak flow								Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To		Man hole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Starting Manhole	Ending Manhole	DWF in cum/day	Cumulative flow in cum/day	Peak Factor	Cum Peak Factor	GW+UAC	Total Flow	Required dia.	ID	OD	MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6 m/s)	Fall m	Manhole Drop m	From	To	Starting Manhole	Ending manhole				
343	WF RD M2	WF RD M1	1	1	C		30	113.00	1.934	1.880	2.19	8.26	2.25	0.215	0.000	0.215	17	200	203	DWC	556	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.27		0.10	1.66	1.78	OK		
344	WF RD M1	SAYN RD M28.11	1	1	C		30	143.00	1.880	1.959	2.19	10.45	2.25	0.272	0.000	0.272	19	200	203	DWC	-380	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.10		-0.07	1.78	2.03	OK		
345	WL RD M6	WL RD M7	0	1	H		20	20.00	2.040	2.014	1.46	1.46	2.25	0.038	0.000	0.038	7	200	203	DWC	769	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.94		0.83	1.10	1.18	OK		
346	WL RD M7	WL RD M8	1	1	C		27	47.00	2.014	2.017	1.97	3.44	2.25	0.089	0.000	0.089	11	200	203	DWC	-9000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	0.83		0.68	1.18	1.34	OK		
347	WL RD M8	WL RD M9	1	1	C		14	61.00	2.017	2.006	1.02	4.46	2.25	0.116	0.000	0.116	13	200	203	DWC	1273	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.68		0.60	1.34	1.41	OK		
348	WL RD M25	WL RD M24	0	1	H		13	13.00	1.954	1.919	0.95	0.95	2.25	0.025	0.000	0.025	6	200	203	DWC	371	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	0.85		0.78	1.10	1.14	OK		
349	WL RD M24	WL RD M23	1	1	C		18	31.00	1.919	1.864	1.32	2.27	2.25	0.059	0.000	0.059	9	200	203	DWC	327	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	0.78		0.68	1.14	1.18	OK		
350	WL RD M23.3	WL RD M23.2	0	1	H		31	31.00	1.920	1.903	2.27	2.27	2.25	0.059	0.000	0.059	9	200	203	DWC	1824	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.82		0.65	1.10	1.25	OK		
351	WL RD M23.2	WL RD M23.1	1	1	C		32	63.00	1.903	1.886	2.34	4.60	2.25	0.120	0.000	0.120	13	200	203	DWC	1882	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.18	0.00	0.65		0.47	1.25	1.42	OK		
352	WL RD M23.1	WL RD M23	1	1	C		32	95.00	1.886	1.864	2.34	6.94	2.25	0.181	0.000	0.181	16	200	203	DWC	1455	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	0.47		0.29	1.42	1.57	OK		
353	WL RD M23	WL RD M22	2	1	J		30	156.00	1.864	1.788	2.19	11.40	2.25	0.297	0.000	0.297	20	200	203	DWC	395	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.29	0.29	0.12	1.57	1.67	OK		
354	WL RD M22	WL RD M21	1	1	C		17	173.00	1.920	1.773	1.24	12.65	2.25	0.329	0.000	0.329	21	200	203	DWC	116	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	0.12		0.03	1.80	1.74	OK		
355	WL RD M21	WL RD M20	1	1	C		30	203.00	1.773	1.665	2.19	14.84	2.25	0.386	0.000	0.386	23	200	203	DWC	278	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.03		-0.14	1.74	1.81	OK		
356	WL RD M20	WL RD M19	1	1	C		24	227.00	1.665	1.707	1.75	16.59	2.25	0.432	0.000	0.432	24	200	203	DWC	-571	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	-0.14		-0.27	1.81	1.98	OK		
357	WL RD M19.4	WL RD M19.3	0	1	H		16	16.00	1.622	1.647	1.17	1.17	2.25	0.030	0.000	0.030	7	200	203	DWC	-640	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	0.52		0.43	1.10	1.22	OK		
358	WL RD M19.3	WL RD M19.2	1	1	C		30	46.00	1.647	1.695	2.19	3.36	2.25	0.088	0.000	0.088	11	200	203	DWC	-625	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.43		0.26	1.22	1.44	OK		
359	WL RD M19.2	WL RD M19.1	1	1	C		30	76.00	1.695	1.743	2.19	5.56	2.25	0.145	0.000	0.145	14	200	203	DWC	-625	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.26		0.09	1.44	1.65	OK		
360	WL RD M19.1	WL RD M19	1	1	C		30	106.00	1.743	1.707	2.19	7.75	2.25	0.202	0.000	0.202	17	200	203	DWC	833	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.09		-0.08	1.65	1.79	OK		
361	WL RD M19	WL RD M18	2	1	J		20	353.00	1.795	1.707	1.46	25.80	2.25	0.672	0.000	0.672	30	200	203	DWC	227	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	-0.27	-0.27	-0.32	2.07	2.03	OK		
362	WL RD M18	WL RD M17	1	1	C		21	374.00	1.795	1.817	1.53	27.34	2.25	0.712	0.000	0.712	31	200	203	DWC	-955	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	-0.32		-0.37	2.12	2.19	OK		
363	WL RD M17.1	WL RD M17	0	1	H		30	30.00	1.850	1.817	2.19	2.19	2.25	0.057	0.000	0.057	9	200	203	DWC	909	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.75		0.58	1.10	1.24	OK		
364	WL RD M17	WL RD M16	2	1	J		20	424.00	1.817	1.864	1.46	30.99	2.25	0.807	0.000	0.807	33	200	203	DWC	-426	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	-0.37	-0.37	-0.41	2.19	2.27	OK		
365	WL RD M16	WL RD M15	1	1	C		20	444.00	1.864	1.912	1.46	32.45	2.25	0.845	0.000	0.845	33	200	203	DWC	-417	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	-0.41		-0.45	2.27	2.36	OK		
366	WL RD M15.2	WL RD M15.1	0	1	H		16	16.00	1.950	1.933	1.17	1.17	2.25	0.030	0.000	0.030	7	200	203	DWC	941	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	0.85		0.76	1.10	1.17	OK		
367	WL RD M15.1	WL RD M15	1	1	C		26	42.00	1.933	1.912	1.90	3.07	2.25	0.080	0.000	0.080	11	200	203	DWC	1238	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.76		0.62	1.17	1.29	OK		
368	WL RD M15	WL RD M14	2	1	J		18	504.00	1.912	1.849	1.32	36.84	2.25	0.959	0.000	0.959	35	200	203	DWC	286	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.03	0.00	-0.45	-0.45	-0.48	2.36	2.33	OK		
369	WL RD M14	WL RD M13	1	1	C		20	524.00	1.849	1.784	1.46	38.30	2.25	0.997	0.000	0.997	36	200	203	DWC	308	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	-0.48		-0.52	2.33	2.30	OK		
370	WL RD M13.1	WL RD M13.2	0	1	H		30	30.00	2.134	1.876	2.19	2.19	2.25	0.057	0.000	0.057	9	200	203	DWC	116	116	0.010	1.26	39.67	0.00	0.30	0.07	OK	0.38	OK	0.26	0.00	1.03		0.77	1.10	1.11	OK		
371	WL RD M13.2	WL RD M13.3	1	1	C		30	60.00	1.876	1.822	2.19	4.39	2.25	0.114	0.000	0.114	13	200	203	DWC	556	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.77		0.60	1.11	1.22	OK		
372	WL RD M13.3	WL RD M13.4	1	1	C		30	90.00	1.822	1.764	2.19	6.58	2.25	0.171	0.000	0.171	15	200	203	DWC	517	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.60		0.43	1.22	1.33	OK		
373	WL RD M13.4	WL RD M13	1	1	C		30	120.00	1.764	1.784	2.19	8.77	2.25	0.228	0.000	0.228	18	200	203	DWC	-1500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.43		0.26	1.33	1.52	OK		
374	WL RD M13	WL RD M12	2	1	J		17	661.00	1.784	1.757	1.24	48.32	2.25	1.258	0.000	1.258	41	200	203	DWC	630	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.03	0.00	-0.52	-0.52	-0.55	2.30	2.31	OK		
375	WL RD M12.2	WL RD M12.1	0	1	H		26	26.00	1.720	1.735	1.90	1.90	2.25	0.049	0.000	0.049	8	200	203	DWC	-1733	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.62		0.48	1.10	1.26	OK		
376	WL RD M12.1	WL RD M12	1	1	C		32	58.00	1.735	1.757	2.34	4.24	2.25	0.110	0.000	0.110	12	200	203	DWC	-1455	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.18	0.00	0.48		0.30	1.26	1.46	OK		
377	WL RD M12	WL RD M12A	2	1	J		12	731.00	1.757	1.745	0.88	53.43	2.25	1.391	0.000	1.391	43	200	203	DWC																					

Sl. No.	Man Holes								Ground Levels				FLOWS LPS				Proposed Size of Sewer in mm					As per Manning Table			At Ultimate peak flow								Invert Level in m			Depth of cutting in m		Check Depth of cutting	
	From	To		Man hole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Starting Manhole	Ending Manhole	DWF in cum/day	Cumulative flow in cum/day	Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow	Required dia.	ID	OD	MOC	Ground Slope in 1	Slope Provided in 1	Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.6 m/s)	Fall m	Manhole Drop m	From	To	Starting Manhole	Ending manhole		
412	RN RD M20.1	RN RD M20	0	1	H	30		30.00	1.812	1.872	2.19	2.19	2.25	0.057	0.000	0.057	9	200	203	DWC	-500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.71		0.54	1.10	1.33	OK
413	RN RD M20	RN RD M19	2	1	J	4		144.00	1.872	2.117	0.29	10.53	2.25	0.274	0.000	0.274	19	200	203	DWC	-16	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.02	0.00	0.22	0.22	0.20	1.65	1.92	OK
414	PT RD M3	PT RD M4	0	1	H	30		30.00	2.194	1.999	2.19	2.19	2.25	0.057	0.000	0.057	9	200	203	DWC	154	154	0.010	1.10	34.48	0.00	0.30	0.07	OK	0.33	OK	0.20	0.00	1.09		0.89	1.10	1.11	OK
415	PT RD M4	RN RD M19	1	1	C	22		52.00	2.117	2.117	1.61	3.80	2.25	0.099	0.000	0.099	12	200	203	DWC	-186	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	0.89		0.77	1.11	1.35	OK
416	RN RD M19	RN RD M18	2	1	J	30		226.00	2.117	2.027	2.19	16.52	2.25	0.430	0.000	0.430	24	200	203	DWC	333	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.20	0.20	0.03	1.92	2.00	OK
417	RN RD M18	RN RD M17	1	1	C	30		256.00	2.027	1.900	2.19	18.71	2.25	0.487	0.000	0.487	25	200	203	DWC	236	180	0.010	1.01	31.84	0.02	0.40	0.10	OK	0.40	OK	0.17	0.00	0.03		-0.14	2.00	2.04	OK
418	RN RD M17	RN RD M16	1	1	C	25		281.00	1.900	1.900	1.83	20.54	2.25	0.535	0.000	0.535	27	200	203	DWC	0	180	0.010	1.01	31.84	0.02	0.40	0.10	OK	0.40	OK	0.14	0.00	-0.14		-0.28	2.04	2.18	OK
419	RN RD M16	RN RD M15	1	1	C	18		299.00	1.900	1.867	1.32	21.86	2.25	0.569	0.000	0.569	27	200	203	DWC	545	180	0.010	1.01	31.84	0.02	0.40	0.10	OK	0.40	OK	0.10	0.00	-0.28		-0.38	2.18	2.25	OK
420	RN RD M15.3	RN RD M15.2	0	1	H	22		22.00	1.872	1.894	1.61	1.61	2.25	0.042	0.000	0.042	8	200	203	DWC	-1000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	0.77		0.65	1.10	1.24	OK
421	RN RD M15.2.1	RN RD M15.2	0	1	H	28		28.00	1.954	1.894	2.05	2.05	2.25	0.053	0.000	0.053	9	200	203	DWC	467	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	0.85		0.69	1.10	1.20	OK
422	RN RD M15.2	RN RD M15.1	2	1	J	18		68.00	1.894	1.946	1.32	4.97	2.25	0.129	0.000	0.129	13	200	203	DWC	-346	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	0.65	0.65	0.55	1.24	1.40	OK
423	RN RD M15.1	RN RD M15	1	1	C	25		93.00	1.946	1.867	1.83	6.80	2.25	0.177	0.000	0.177	16	200	203	DWC	316	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	0.55		0.41	1.40	1.46	OK
424	RN RD M15	RN RD M14	2	1	J	15		407.00	1.867	1.933	1.10	29.75	2.25	0.775	0.000	0.775	32	200	203	DWC	-227	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.03	0.00	-0.38	-0.38	-0.41	2.25	2.34	OK
425	RN RD M1	RN RD M2	0	1	H	26		26.00	1.974	1.966	1.90	1.90	2.25	0.049	0.000	0.049	8	200	203	DWC	3250	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.87		0.73	1.10	1.24	OK
426	RN RD M2	RN RD M3	1	1	C	25		51.00	1.966	1.970	1.83	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	-6250	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.73		0.59	1.24	1.38	OK
427	RN RD M3	RN RD M4	1	1	C	24		75.00	1.970	1.922	1.75	5.48	2.25	0.143	0.000	0.143	14	200	203	DWC	500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	0.59		0.46	1.38	1.46	OK
428	RN RD M4.3	RN RD M4.2	0	1	H	30		30.00	1.994	2.012	2.19	2.19	2.25	0.057	0.000	0.057	9	200	203	DWC	-1667	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.89		0.72	1.10	1.29	OK
429	RN RD M4.2	RN RD M4.1	1	1	C	24		54.00	2.012	2.052	1.75	3.95	2.25	0.103	0.000	0.103	12	200	203	DWC	-600	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	0.72		0.59	1.29	1.46	OK
430	RN RD M4.1	RN RD M4	1	1	C	30		84.00	2.052	1.922	2.19	6.14	2.25	0.160	0.000	0.160	15	200	203	DWC	231	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.59		0.42	1.46	1.50	OK
431	RN RD M4	RN RD M5	2	1	J	17		176.00	1.922	1.954	1.24	12.86	2.25	0.335	0.000	0.335	21	200	203	DWC	-531	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	0.42	0.42	0.33	1.50	1.62	OK
432	RN RD M5.3	RN RD M5.2	0	1	H	14		14.00	1.914	1.927	1.02	1.02	2.25	0.027	0.000	0.027	6	200	203	DWC	-1077	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.81		0.73	1.10	1.20	OK
433	RN RD M5.2	RN RD M5.1	1	1	C	30		44.00	1.927	1.947	2.19	3.22	2.25	0.084	0.000	0.084	11	200	203	DWC	-1500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.73		0.56	1.20	1.39	OK
434	RN RD M5.1	RN RD M5	1	1	C	30		74.00	1.947	1.954	2.19	5.41	2.25	0.141	0.000	0.141	14	200	203	DWC	-4286	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.56		0.39	1.39	1.56	OK
435	RN RD M5	RN RD M6	2	1	J	20		270.00	1.954	1.967	1.46	19.74	2.25	0.514	0.000	0.514	26	200	203	DWC	-1538	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	0.33	0.33	0.27	1.62	1.70	OK
436	RN RD M6	RN RD M7	1	1	C	20		290.00	1.967	1.980	1.46	21.20	2.25	0.552	0.000	0.552	27	200	203	DWC	-1538	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	0.27		0.22	1.70	1.76	OK
437	RN RD M7	RN RD M8	1	1	C	20		310.00	1.980	1.990	1.46	22.66	2.25	0.590	0.000	0.590	28	200	203	DWC	-2000	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	0.22		0.17	1.76	1.82	OK
438	RN RD M8	RN RD M9	1	1	C	22		332.00	1.990	2.005	1.61	24.27	2.25	0.632	0.000	0.632	29	200	203	DWC	-1467	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	0.17		0.12	1.82	1.89	OK
439	RN RD M9.1	RN RD M9	0	1	H	30		30.00	1.924	2.005	2.19	2.19	2.25	0.057	0.000	0.057	9	200	203	DWC	-370	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.82		0.65	1.10	1.36	OK
440	RN RD M9	RN RD M10	2	1	J	15		377.00	2.005	1.874	1.10	27.56	2.25	0.718	0.000	0.718	31	200	203	DWC	115	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.03	0.00	0.12	0.12	0.09	1.89	1.78	OK
441	RN RD M10	RN RD M11	1	1	C	22		399.00	1.874	1.825	1.61	29.16	2.25	0.759	0.000	0.759	32	200	203	DWC	449	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	0.09		0.05	1.78	1.78	OK
442	RN RD M11	RN RD M12	1	1	C	30		429.00	1.825	1.870	2.19	31.36	2.25	0.817	0.000	0.817	33	200	203	DWC	-667	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.05		-0.01	1.78	1.88	OK
443	RN RD M12	RN RD M13	1	1	C	30		459.00	1.870	1.914	2.19	33.55	2.25	0.874	0.000	0.874	34	200	203	DWC	-682	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	-0.01		-0.07	1.88	1.98	OK
444	RN RD M13	RN RD M14	1	1	C	13		472.00	1.914	1.933	0.95	34.50	2.25	0.898	0.000	0.898	34	200	203	DWC	-684	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.03	0.00	-0.07		-0.10	1.98	2.03	OK
445	RN RD M14	NL RD M3	2	1	J	30		909.00	1.933	2.104	2.19	66.44	2.25	1.730	0.000	1.730	47	200	203	DWC	-175	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	-0.41	-0.41	-0.47	2.34	2.57	OK
446	NL RD M3	NL RD M2	1	1	C	30		939.00	2.104	2.072	2.19	68.64	2.25	1.787	0.000	1.787	48	200	203	DWC	937	520	0.010	0.60	18.73	0.10													

Sl. No.	Man Holes				Man hole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6 m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
										Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s				From	To	Starting Manhole	Ending manhole		
481	FAC RD M4	FAC RD M5	1	1	C		30		11038.00	1.944	1.934	2.19	806.82	2.25	21.011	0.000	21.011	164	250	253	DWC	3000	700	0.010	0.60	29.28	0.72	1.09	0.63	OK	0.65	OK	0.04	0.00	-1.76		-1.80	3.70	3.73	OK
482	FAC RD M5	FAC RD M6	1	1	C		30		11068.00	1.934	1.855	2.19	809.01	2.25	21.068	0.000	21.068	164	250	253	DWC	380	700	0.010	0.60	29.28	0.72	1.09	0.63	OK	0.65	OK	0.04	0.00	-1.80		-1.84	3.73	3.70	OK
483	FAC RD M6	FAC RD M7	1	1	C		30		11098.00	1.855	1.877	2.19	811.20	2.25	21.125	0.000	21.125	165	250	253	DWC	-1364	700	0.010	0.60	29.28	0.72	1.09	0.63	OK	0.65	OK	0.04	0.00	-1.84		-1.88	3.70	3.76	OK
484	FAC RD M7	FAC RD M8	1	1	C		30		11128.00	1.877	1.829	2.19	813.39	2.25	21.182	0.000	21.182	165	250	253	DWC	625	700	0.010	0.60	29.28	0.72	1.09	0.63	OK	0.65	OK	0.04	0.00	-1.88		-1.92	3.76	3.75	OK
485	FAC RD M8	FAC RD M9	1	1	C		30		11158.00	1.829	1.799	2.19	815.59	2.25	21.239	0.000	21.239	165	250	253	DWC	1000	700	0.010	0.60	29.28	0.73	1.09	0.64	OK	0.65	OK	0.04	0.00	-1.92		-1.96	3.75	3.76	OK
486	FAC RD M9	FAC RD M10	1	1	C		30		11188.00	1.799	1.945	2.19	817.78	2.25	21.296	0.000	21.296	165	250	253	DWC	-205	700	0.010	0.60	29.28	0.73	1.09	0.64	OK	0.65	OK	0.04	0.00	-1.96		-2.00	3.76	3.95	OK
487	FAC RD M10	FAC RD M11	1	1	C		20		11208.00	1.945	2.090	1.46	819.24	2.25	21.334	0.000	21.334	165	250	253	DWC	-138	700	0.010	0.60	29.28	0.73	1.09	0.64	OK	0.65	OK	0.03	0.00	-2.00		-2.03	3.95	4.12	OK
488	FAC RD M11	FAC RD M12	1	1	C		30		11238.00	2.090	1.988	2.19	821.44	2.25	21.392	0.000	21.392	166	250	253	DWC	294	700	0.010	0.60	29.28	0.73	1.09	0.64	OK	0.65	OK	0.04	0.00	-2.03		-2.07	4.12	4.06	OK
489	FAC RD M12	FAC RD M13	1	1	C		20		11258.00	1.988	1.988	1.46	822.90	2.25	21.430	0.000	21.430	166	250	253	DWC	0	700	0.010	0.60	29.28	0.73	1.09	0.64	OK	0.65	OK	0.03	0.00	-2.07		-2.10	4.06	4.09	OK
490	FAC RD M13	STP	1	0	C	L	55		11313.00	1.988	1.988	4.02	826.92	2.25	21.534	0.000	21.534	166	250	253	DWC	0	700	0.010	0.60	29.28	0.74	1.09	0.64	OK	0.65	OK	0.08	0.00	-2.10		-2.18	4.09	4.17	OK

SEWER NETWORK DESIGN - ELAMKULAM_BLOCK 7

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in 1	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m		Depth of cutting in m		Check Depth of cutting	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From	To	Starting Manhole	Ending manhole		
1	4	5	6	7	8	9	10.00	11	12	13.000	14.000	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
1	AT RD M9.1	AT RD M9.2	0	1	H		30.00		30.00	0.704	0.631	5.08	5.08	2.25	0.132	0.000	0.132	13	200	203	DWC	411	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.40		-0.57	1.10	1.20	OK
2	AT RD M9.2	AT RD M9.3	1	1	C		30.00		60.00	0.631	0.655	5.08	10.16	2.25	0.265	0.000	0.265	19	200	203	DWC	-1250	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.57		-0.74	1.20	1.40	OK
3	AT RD M9.3	AT RD M9.4	1	1	C		30.00		90.00	0.655	0.693	5.08	15.24	2.25	0.397	0.000	0.397	23	200	203	DWC	-789	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.74		-0.91	1.40	1.60	OK
4	AT RD M9.4.9A1	AT RD M9.4.9J	0	1	H		20.12		20.12	0.934	1.25	3.41	3.41	2.25	0.089	0.000	0.089	11	200	203	DWC	-64	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	-0.17		-0.28	1.10	1.53	OK
5	AT RD M9.4.9J	AT RD M9.4.9I	1	1	C		30.00		50.12	1.25	1.014	5.08	8.49	2.25	0.221	0.000	0.221	17	200	203	DWC	127	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.28		-0.45	1.53	1.46	OK
6	AT RD M9.4.9E	AT RD M9.4.9F	0	1	H		20.40		20.40	1.094	1.114	3.45	3.45	2.25	0.090	0.000	0.090	11	200	203	DWC	-1020	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	-0.01		-0.12	1.10	1.23	OK
7	AT RD M9.4.9F	AT RD M9.4.9G	1	1	C		30.00		50.40	1.114	0.974	5.08	8.53	2.25	0.222	0.000	0.222	17	200	203	DWC	214	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.12		-0.29	1.23	1.26	OK
8	AT RD M9.4.9G	AT RD M9.4.9I	1	1	C		23.27		73.67	0.974	1.014	3.94	12.48	2.25	0.325	0.000	0.325	21	200	203	DWC	-582	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	-0.29		-0.42	1.26	1.43	OK
9	AT RD M9.4.9I	AT RD M9.4.9H	2	1	J		0.98		124.77	1.01	0.974	0.17	21.13	2.25	0.550	0.000	0.550	27	200	203	DWC	27	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.00	0.00	-0.91	-0.91	-0.91	1.92	1.88	OK
10	AT RD M9.4.9K	AT RD M9.4.9H	0	1	H		38.00		38.00	0.985	0.974	6.43	6.43	2.25	0.168	0.000	0.168	15	200	203	DWC	3455	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.21	0.00	-0.12		-0.33	1.11	1.30	OK
11	AT RD M9.4.9H	AT RD M9.4.6	2	1	J		12.96		175.73	0.974	1.375	2.19	29.76	2.25	0.775	0.000	0.775	32	200	203	DWC	-32	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.02	0.00	-0.91	-0.91	-0.93	1.88	2.31	OK
12	AT RD M9.4.6	AT RD M9.4.5	1	1	C		18.50		194.23	1.375	1.194	3.13	32.89	2.25	0.857	0.000	0.857	34	200	203	DWC	102	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	-0.93		-0.97	2.31	2.16	OK
13	AT RD M9.4.5	AT RD M9.4.4	1	1	C		30.00		224.23	1.194	1.292	5.08	37.97	2.25	0.989	0.000	0.989	36	200	203	DWC	-306	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	-0.97		-1.03	2.16	2.32	OK
14	AT RD M9.4.4	AT RD M9.4.3	1	1	C		30.00		254.23	1.292	1.272	5.08	43.05	2.25	1.121	0.000	1.121	38	200	203	DWC	1500	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	-1.03		-1.09	2.32	2.36	OK
15	AT RD M9.4.3	AT RD M9.4.2	1	1	C		30.00		284.23	1.272	1.186	5.08	48.13	2.25	1.253	0.000	1.253	40	200	203	DWC	349	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	-1.09		-1.15	2.36	2.34	OK
16	AT RD M9.4.2	AT RD M9.4.1	1	1	C		30.00		314.23	1.186	1.149	5.08	53.21	2.25	1.386	0.000	1.386	43	200	203	DWC	811	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	-1.15		-1.21	2.34	2.36	OK
17	AT RD M9.4.1	AT RD M9.4	1	1	C		30.00		344.23	1.149	0.693	5.08	58.29	2.25	1.518	0.000	1.518	44	200	203	DWC	66	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	-1.21		-1.27	2.36	1.96	OK
18	AT RD M9.4	AT RD M9.5	2	1	J		25.37		459.60	0.693	0.68	4.30	77.83	2.25	2.027	0.000	2.027	51	200	203	DWC	1952	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.05	0.00	-1.27	-1.27	-1.32	1.96	2.00	OK
19	AT RD M9.5	AT RD M9.6	1	1	C		30.00		489.60	0.68	0.654	5.08	82.91	2.25	2.159	0.000	2.159	53	200	203	DWC	1154	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	-1.32		-1.38	2.00	2.03	OK
20	AT RD M9.6	AT RD M9.7	1	1	C		30.00		519.60	0.654	0.636	5.08	87.99	2.25	2.291	0.000	2.291	55	200	203	DWC	1667	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	-1.38		-1.44	2.03	2.08	OK
21	AT RD M9.7	AT RD M9.8	1	1	C		30.00		549.60	0.636	0.639	5.08	93.07	2.25	2.424	0.000	2.424	56	200	203	DWC	-10000	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.06	0.00	-1.44		-1.50	2.08	2.14	OK
22	AT RD M9.8	AT RD M9.9	1	1	C		30.00		579.60	0.639	0.602	5.08	98.15	2.25	2.556	0.000	2.556	58	200	203	DWC	811	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.06	0.00	-1.50		-1.56	2.14	2.16	OK
23	AT RD M9.9	AT RD M9.10	1	1	C		30.00																																	

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.3m/s)	Fall m	Manhole Drop m	Invert Level in m		Depth of cutting in m		Check Depth of cutting	
														Peak Factor	Cum Peak Factor	GW+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s				From	To	Starting Manhole	Ending manhole		
72	AT RD M12.1	AT RD M12.2	0	1	H		30.00		30.00	1.045	0.966	5.08	5.08	2.25	0.132	0.000	0.132	13	200	203	DWC	380	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.06		-0.23	1.11	1.20	OK
73	AT RD M12.2	AT RD M12.3	1	1	C		30.00		60.00	0.966	0.875	5.08	10.16	2.25	0.265	0.000	0.265	19	200	203	DWC	330	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.23		-0.40	1.20	1.28	OK
74	AT RD M12.3	AT RD M12	1	1	C		27.00		87.00	0.875	0.849	4.57	14.73	2.25	0.384	0.000	0.384	23	200	203	DWC	1038	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.15	0.00	-0.40		-0.55	1.28	1.40	OK
75	AT RD M12	AT RD M13	2	1	J		19.00		1869.37	0.849	0.796	3.22	316.56	2.25	8.244	0.000	8.244	103	200	203	DWC	358	520	0.010	0.60	18.73	0.44	0.98	0.47	OK	0.58	OK	0.04	0.00	-2.19	-2.19	-2.23	3.04	3.03	OK
76	SPN RD M31.2	SPN RD M31.1	0	1	H		30.00		30.00	1.102	1.055	5.08	5.08	2.25	0.132	0.000	0.132	13	200	203	DWC	638	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.00		-0.17	1.10	1.23	OK
77	SPN RD M31.1	SPN RD M31	1	1	C		11.50		41.50	1.055	1.143	1.95	7.03	2.25	0.183	0.000	0.183	16	200	203	DWC	-131	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	-0.17		-0.23	1.23	1.37	OK
78	SPN RD M31	SPN RD M30	1	1	C		30.00		71.50	1.143	1.054	5.08	12.11	2.25	0.315	0.000	0.315	21	200	203	DWC	337	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.23		-0.40	1.37	1.45	OK
79	SPN RD M30	SPN RD M29	1	1	C		12.17		83.67	1.054	1.07	2.06	14.17	2.25	0.369	0.000	0.369	22	200	203	DWC	-761	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	-0.40		-0.47	1.45	1.54	OK
80	SPN RD M29.2	SPN RD M29.1	0	1	H		30.00		30.00	1.281	1.21	5.08	5.08	2.25	0.132	0.000	0.132	13	200	203	DWC	423	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.18		0.01	1.10	1.20	OK
81	SPN RD M29.1	SPN RD M29	1	1	C		38.70		68.70	1.21	1.07	6.55	11.63	2.25	0.303	0.000	0.303	20	200	203	DWC	276	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.22	0.00	0.01		-0.21	1.20	1.28	OK
82	SPN RD M29	SPN RD M28	2	1	J		36.00		188.37	1.070	1.089	6.10	31.90	2.25	0.831	0.000	0.831	33	200	203	DWC	-1895	420	0.010	0.66	20.85	0.04	0.51	0.15	OK	0.34	OK	0.09	0.00	-0.47	-0.47	-0.56	1.54	1.65	OK
83	SPN RD M28.1	SPN RD M28.2	0	1	H		30.00		30.00	1.124	0.853	5.08	5.08	2.25	0.132	0.000	0.132	13	200	203	DWC	111	111	0.010	1.29	40.55	0.00	0.30	0.07	OK	0.39	OK	0.27	0.00	0.02		-0.25	1.10	1.10	OK
84	SPN RD M28.2	SPN RD M28.3	1	1	C		30.00		60.00	0.853	0.899	5.08	10.16	2.25	0.265	0.000	0.265	19	200	203	DWC	-652	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.25		-0.42	1.10	1.32	OK
85	SPN RD M28.3	SPN RD M28.4	1	1	C		15.00		75.00	0.899	0.874	2.54	12.70	2.25	0.331	0.000	0.331	21	200	203	DWC	600	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	-0.42		-0.50	1.32	1.37	OK
86	SPN RD M28.4	SPN RD M28	1	1	C		30.00		105.00	0.874	1.084	5.08	17.78	2.25	0.463	0.000	0.463	25	200	203	DWC	-143	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.50		-0.67	1.37	1.75	OK
87	SPN RD M28	SPN RD M27	2	1	J		23.00		316.37	1.084	0.997	3.89	53.57	2.25	1.395	0.000	1.395	43	200	203	DWC	264	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.04	0.00	-0.67	-0.67	-0.71	1.75	1.71	OK
88	SPN RD M27	AT RD M13.1	1	1	C		22.00		338.37	0.997	0.941	3.73	57.30	2.25	1.492	0.000	1.492	44	200	203	DWC	393	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.04	0.00	-0.71		-0.75	1.71	1.69	OK
89	AT RD M13.1	AT RD M13.2	1	1	C		30.00		368.37	0.941	0.984	5.08	62.38	2.25	1.624	0.000	1.624	46	200	203	DWC	-698	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	-0.75		-0.81	1.69	1.79	OK
90	AT RD M13.2	AT RD M13.3	1	1	C		30.00		398.37	0.984	0.915	5.08	67.46	2.25	1.757	0.000	1.757	48	200	203	DWC	435	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	-0.81		-0.87	1.79	1.79	OK
91	AT RD M13.3	AT RD M13	1	1	C		30.00		428.37	0.915	0.794	5.08	72.54	2.25	1.889	0.000	1.889	50	200	203	DWC	248	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	-0.87		-0.93	1.79	1.72	OK
92	AT RD M13	AT RD M14	2	1	J		30.00		2327.74	0.794	0.971	5.08	394.18	2.25	10.265	0.000	10.265	115	200	203	DWC	-169	520	0.010	0.60	18.73	0.55	1.02	0.53	OK	0.61	OK	0.06	0.00	-2.23	-2.23	-2.29	3.02	3.26	OK
93	AT RD M14	AT RD M15	1	1	C		37.00		2364.74	0.971	0.727	6.27	400.45	2.25	10.428	0.000	10.428	116	200	203	DWC	152	520	0.010	0.60	18.73	0.56	1.03	0.54	OK	0.61	OK	0.07	0.00	-2.29		-2.36	3.26	3.09	OK
94	AT RD M15.1	AT RD M15.2	0	1	H		30.00		30.00	0.75	0.775	5.08	5.08	2.25	0.132	0.000	0.132	13	200	203	DWC	-1200	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.35		-0.52	1.10	1.30	OK
95	AT RD M15.2	AT RD M15.3	1	1	C		30.00		60.00	0.775	0.801	5.08	10.16	2.25	0.265	0.000	0.265	19	200	203	DWC	-1154	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.52		-0.69	1.30	1.49	OK
96	AT RD M15.3	AT RD M15.4	1	1	C		38.00		98.00	0.801	0.673	6.43	16.60	2.25	0.432	0.000	0.432	24	200	203	DWC	297	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.21	0.00	-0.69		-0.90	1.49	1.57	OK
97	AT RD M15.4	AT RD M15	1	1	C		30.00		128.00	0.673	0.727	5.08	21.68	2.25	0.564	0.000	0.564	27	200	203	DWC	-556	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	-0.90		-0.97	1.57	1.70	OK
98	AT RD M15	AT RD M16	2	1	J		30.00		2522.74	0.727	0.792	5.08	427.20	2.25	11.125	0.000	11.125	120	200	203	DWC	-462	520	0.010	0.60	18.73	0.59	1.04	0.56	OK	0.62	OK	0.06	0.00	-2.36	-2.36	-2.42	3.09	3.21	OK
99	AT RD M16	AT RD M17	1	1	C		30.00		2552.74	0.792	0.614	5.08	432.28	2.25	11.257	0.000	11.257	120	200	203	DWC	169	520	0.010	0.60	18.73	0.60	1.04	0.56	OK	0.62	OK	0.06	0.00	-2.42		-2.48	3.21	3.09	OK
100	AT RD M17	AT RD M18	1	1	C		15.00		2567.74	0.614	0.824	2.54	434.82	2.25	11.324	0.000	11.324	121	200	203	DWC	-71	520	0.010	0.60	18.73	0.60	1.04	0.56	OK	0.62	OK	0.03	0.00	-2.48		-2.51	3.09	3.33	OK
101	AT RD M18.1	AT RD M18	0	1	H		25.00		25.00	0.824	0.839	4.23	4.23	2.25	0.110	0.000	0.110	12	200	203	DWC	-1667	180	0.010	1.01	31.84														

SEWER NETWORK DESIGN - ELAMKULAM -BLOCK8

Sl. No.	Man Holes				Ma nho le Typ e	MANH OLE TYPE	Length in m	CUMULATI VE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting	
										Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s			Check Velocity (> 0.6m/s)	From	To	Starting Manhole	Ending manhole		
	From	To																																						30
1	4	5	6	7	8	9	10.00	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
1	AT RD M31	AT RD M30	0	1	H		30		30.00	0.844	0.950	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	-283	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.26		-0.43	1.10	1.38	OK
2	AT RD M30	AT RD M29	1	1	C		30		60.00	0.950	0.664	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	105	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.43		-0.60	1.38	1.26	OK
3	AT RD M29	AT RD M28	1	1	C		30		90.00	0.664	0.931	3.73	11.18	2.25	0.291	0.000	0.291	20	200	203	DWC	-112	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.60		-0.77	1.26	1.70	OK
4	AT RD M28	AT RD M27	1	1	C		30		120.00	0.931	0.876	3.73	14.91	2.25	0.388	0.000	0.388	23	200	203	DWC	545	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.77		-0.94	1.70	1.82	OK
5	AT RD M27	AT RD M26	1	1	C		30		150.00	0.876	1.055	3.73	18.64	2.25	0.485	0.000	0.485	25	200	203	DWC	-168	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	-0.94		-1.03	1.82	2.09	OK
6	AT RD M26	AT RD M25	1	1	C		30		180.00	1.055	1.131	3.73	22.37	2.25	0.582	0.000	0.582	28	200	203	DWC	-395	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	-1.03		-1.10	2.09	2.23	OK
7	AT RD M23	AT RD M24	0	1	H		26		26.00	1.160	0.874	3.23	3.23	2.25	0.084	0.000	0.084	11	200	203	DWC	91	91	0.010	1.42	44.79	0.00	0.30	0.07	OK	0.43	OK	0.29	0.00	0.06		-0.23	1.10	1.10	OK
8	AT RD M24	AT RD M25	1	1	C		19		45.00	0.874	1.131	2.36	5.59	2.25	0.146	0.000	0.146	14	200	203	DWC	-74	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	-0.23		-0.34	1.10	1.47	OK
9	AT RD M25	JKP RD M1	2	1	J		30		255.00	1.131	0.822	3.73	31.69	2.25	0.825	0.000	0.825	33	200	203	DWC	97	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	-1.10	-1.10	-1.16	2.23	1.98	OK
10	JKP RD M1	JKP RD M2	1	1	C		30		285.00	0.822	0.723	3.73	35.41	2.25	0.922	0.000	0.922	35	200	203	DWC	303	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	-1.16		-1.22	1.98	1.94	OK
11	JKP RD M2	JKP RD M3	1	1	C		30		315.00	0.723	0.713	3.73	39.14	2.25	1.019	0.000	1.019	37	200	203	DWC	3000	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	-1.22		-1.28	1.94	1.99	OK
12	JKP RD M3	JKP RD M4	1	1	C		12		327.00	0.713	0.798	1.49	40.63	2.25	1.058	0.000	1.058	37	200	203	DWC	-141	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.02	0.00	-1.28		-1.30	1.99	2.10	OK
13	JKP RD M7	JKP RD M6	0	1	H		38		38.00	0.530	0.732	4.72	4.72	2.25	0.123	0.000	0.123	13	200	203	DWC	-188	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.21	0.00	-0.57		-0.78	1.10	1.51	OK
14	JKP RD M6	JKP RD M5	1	1	C		30		68.00	0.732	0.740	3.73	8.45	2.25	0.220	0.000	0.220	17	200	203	DWC	-3750	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.78		-0.95	1.51	1.69	OK
15	JKP RD M5	JKP RD M4	1	1	C		27		95.00	0.740	0.798	3.36	11.80	2.25	0.307	0.000	0.307	20	200	203	DWC	-466	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.15	0.00	-0.95		-1.10	1.69	1.90	OK
16	JKP RD M4	JKP RD M4.1	2	1	J		23		445.00	0.798	0.599	2.86	55.30	2.25	1.440	0.000	1.440	43	200	203	DWC	116	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.04	0.00	-1.30	-1.30	-1.34	2.10	1.94	OK
17	JKP RD M4.1	SST RD M3	1	1	C		23		468.00	0.599	0.532	2.86	58.15	2.25	1.514	0.000	1.514	44	200	203	DWC	343	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.04	0.00	-1.34		-1.38	1.94	1.91	OK
18	SST RD M12	SST RD M11	0	1	H		30		30.00	1.101	0.946	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	194	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.00		-0.17	1.10	1.12	OK
19	SST RD M11	SST RD M10	1	1	C		30		60.00	0.946	0.777	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	178	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.17		-0.34	1.12	1.12	OK
20	SST RD M10.1	SST RD M10.2	0	1	H		30		30.00	1.390	1.229	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	186	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.29		0.12	1.10	1.11	OK
21	SST RD M10.2	SST RD M10.3	1	1	C		30		60.00	1.229	1.069	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	188	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.12		-0.05	1.11	1.12	OK
22	SST RD M10.3	SST RD M10.4	1	1	C		30		90.00	1.069	0.910	3.73	11.18	2.25	0.291	0.000	0.291	20	200	203	DWC	189	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.05		-0.22	1.12	1.13	OK
23	SST RD M10.4	SST RD M10	1	1	C		25		115.00	0.910	0.780	3.11	14.29	2.25	0.372	0.000	0.372	22	200	203	DWC	192	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	-0.22		-0.36	1.13	1.14	OK
24	SST RD M10	SST RD M9	2	1	J		30		205.00	0.780	0.699																													

Sl. No.	Man Holes				Ma nho le Typ e	MANH OLE TYPE	Length in m	CUMULATI VE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Check Velocity (> 0.6m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW1+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)/m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole		
72	SO RD M3.2	JKI RD M7.2	0	1	H		18	18.00	0.933	0.855	2.24	2.24	2.25	0.058	0.000	0.058	0.058	9	200	203	DWC	231	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	-0.17		-0.27	1.10	1.13	OK	
73	JKI RD M7.2	JKI RD M7.3	2	1	J		23	604.00	0.855	0.799	2.86	75.05	2.25	1.955	0.000	1.955	50	200	203	DWC	411	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.04	0.00	-0.76	-0.76	-0.80	1.62	1.60	OK		
74	JKI RD M7.3	JKI RD M7.4	1	1	C		12	616.00	0.799	0.838	1.49	76.55	2.25	1.993	0.000	1.993	51	200	203	DWC	-308	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.02	0.00	-0.80		-0.82	1.60	1.66	OK		
75	JKI RD M7.4	SM RD M6	1	1	C		30	646.00	0.838	0.661	3.73	80.27	2.25	2.090	0.000	2.090	52	200	203	DWC	169	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	-0.82		-0.88	1.66	1.54	OK		
76	SM RD M11	SM RD M10	0	1	H		30	30.00	0.910	1.074	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	-183	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.19		-0.36	1.10	1.43	OK		
77	SM RD M10	SM RD M9	1	1	C		30	60.00	1.074	0.813	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	115	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.36		-0.53	1.43	1.34	OK		
78	SM RD M9	SM RD M8	1	1	C		30	90.00	0.813	0.667	3.73	11.18	2.25	0.291	0.000	0.291	20	200	203	DWC	205	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.53		-0.70	1.34	1.37	OK		
79	SM RD M8	SM RD M7	1	1	C		22	112.00	0.670	0.739	2.73	13.92	2.25	0.362	0.000	0.362	22	200	203	DWC	-319	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	-0.70		-0.82	1.37	1.56	OK		
80	SM RD M7.1	SM RD M7.2	0	1	H		19	19.00	0.862	0.727	2.36	2.36	2.25	0.061	0.000	0.061	9	200	203	DWC	141	140	0.010	1.15	36.11	0.00	0.30	0.07	OK	0.34	OK	0.14	0.00	-0.24		-0.38	1.10	1.11	OK		
81	SM RD M7.2	SM RD M7.3	1	1	C		30	49.00	0.727	0.681	3.73	6.09	2.25	0.159	0.000	0.159	15	200	203	DWC	652	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.38		-0.55	1.11	1.23	OK		
82	SM RD M7.3	SM RD M7	1	1	C		30	79.00	0.681	0.739	3.73	9.82	2.25	0.256	0.000	0.256	19	200	203	DWC	-517	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.55		-0.72	1.23	1.46	OK		
83	SM RD M7	SM RD M6	2	1	J		37	228.00	0.740	0.660	4.60	28.33	2.25	0.738	0.000	0.738	31	200	203	DWC	463	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.07	0.00	-0.82	-0.82	-0.89	1.56	1.55	OK		
84	SM RD M6	SM RD M5	2	1	J		19	893.00	0.661	0.652	2.36	110.97	2.25	2.890	0.000	2.890	61	200	203	DWC	2111	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.04	0.00	-0.89	-0.89	-0.93	1.55	1.58	OK		
85	SM RD M5	SM RD M4	1	1	C		30	923.00	0.652	0.601	3.73	114.69	2.25	2.987	0.000	2.987	62	200	203	DWC	588	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.06	0.00	-0.93		-0.99	1.58	1.59	OK		
86	SM RD M4	SM RD M3	2	1	J		24	2173.00	0.601	0.499	2.98	270.02	2.25	7.032	0.000	7.032	95	200	203	DWC	235	520	0.010	0.60	18.73	0.38	0.93	0.43	OK	0.55	OK	0.05	0.00	-2.15	-2.15	-2.20	2.75	2.70	OK		
87	SM RD M1	SM RD M2	0	1	H		40	40.00	0.553	0.504	4.97	4.97	2.25	0.129	0.000	0.129	13	200	203	DWC	816	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.22	0.00	-0.55		-0.77	1.10	1.27	OK		
88	SM RD M2	SM RD M3	1	1	C		30	70.00	0.504	0.480	3.73	8.70	2.25	0.227	0.000	0.227	17	200	203	DWC	1250	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.77		-0.94	1.27	1.42	OK		
89	SM RD M3	SM RD M3.1	2	1	J		25	2268.00	0.480	0.496	3.11	281.83	2.25	7.339	0.000	7.339	97	200	203	DWC	-1563	520	0.010	0.60	18.73	0.39	0.94	0.44	OK	0.56	OK	0.05	0.00	-2.20	-2.20	-2.25	2.68	2.75	OK		
90	SM RD M3.1	CKV LN RD M12	1	1	C		21	2289.00	0.496	0.493	2.61	284.44	2.25	7.407	0.000	7.407	98	200	203	DWC	7000	520	0.010	0.60	18.73	0.40	0.94	0.44	OK	0.56	OK	0.04	0.00	-2.25		-2.29	2.75	2.78	OK		
91	CKV LN RD M14	CKV LN RD M13	0	1	H		18	18.00	0.730	0.697	2.24	2.24	2.25	0.058	0.000	0.058	9	200	203	DWC	545	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	-0.37		-0.47	1.10	1.17	OK		
92	CKV LN RD M13	CKV LN RD M12	1	1	C		30	48.00	0.697	0.493	3.73	5.96	2.25	0.155	0.000	0.155	15	200	203	DWC	147	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.47		-0.64	1.17	1.13	OK		
93	CKV LN RD M12	CKV LN RD M11	2	1	J		30	2367.00	0.493	0.541	3.73	294.13	2.25	7.660	0.000	7.660	99	200	203	DWC	-625	700	0.010	0.51	16.15	0.47	0.99	0.48	OK	0.51	OK	0.04	0.00	-2.29	-2.29	-2.33	2.78	2.87	OK		
94	CKV LN RD M11	CKV LN RD M10	1	1	C		30	2397.00	0.541	0.589	3.73	297.86	2.25	7.757	0.000	7.757	100	200	203	DWC	-625	700	0.010	0.51	16.15	0.48	0.99	0.49	OK	0.51	OK	0.04	0.00	-2.33		-2.37	2.87	2.96	OK		
95	CKV LN RD M10	CKV LN RD M9	1	1	C		22	2419.00	0.589	0.534	2.73	300.59	2.25	7.828	0.000	7.828	100	200	203	DWC	400	700	0.010	0.51	16.15	0.48	0.99	0.49	OK	0.51	OK	0.03	0.00	-2.37		-2.40	2.96	2.93	OK		
96	CKV LN RD M9	CKV LN RD M8	1	1	C		30	2449.00	0.534	0.756	3.73	304.32	2.25	7.925	0.000	7.925	101	200	203	DWC	-135	700	0.010	0.51	16.15	0.49	0.99	0.49	OK	0.51	OK	0.04	0.00	-2.40		-2.44	2.93	3.20	OK		
97	CKV LN RD M8	CKV LN RD M7	1	1	C		27	2476.00	0.756	0.762	3.36	307.67	2.25	8.012	0.000	8.012	102	200	203	DWC	-4500	700	0.010	0.51	16.15	0.50	1.00	0.50	OK	0.51	OK	0.04	0.00	-2.44		-2.48	3.20	3.24	OK		
98	PN RD M9.1	PN RD M9.2	0	1	H		30	30.00	2.942	2.873	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	435	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.84		1.67	1.10	1.20	OK		
99	PN RD M9.2	PN RD M9	1	1	C		30	60.00	2.873	2.933	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	-500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.67		1.50	1.20	1.43	OK		
100	PN RD M9	PN RD M10	1	1	C		32	92.00	2.933	2.944	3.98	11.43	2.25	0.298	0.000	0.298	20	200	203	DWC	-2909	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	1.50		1.32	1.43	1.62	OK		
101	PN RD M10	PN RD M11	1	1	C		30	122.00	2.944	2.960	3.73	15.16	2.25	0.395	0.000	0.395	23	200	203	DWC	-1875	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.32		1.15	1.62	1.81	OK		
102	PN RD M11	PN RD M12	1	1	C		46	168.00	2.960	2.770	5.72	20.88	2.25	0.544	0.000	0.544	27	200	203	DWC	242	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.14	0.00	1.15		1.01	1.81	1.76	OK		
103	PN RD M12	PN RD M13	1	1	C		30	198.00	2.770	2.580	3.73	24.60	2.25	0.641	0.000	0.641	29	200	203	DWC	158	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	1.01		0.94	1.76	1.64	OK		
104	PN RD M13	PN RD M14	1	1	C		30	228.00	2.580	2.515	3.73	28.33	2.25	0.738	0.000	0.738	31	200	203	DWC	462	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.94		0.88	1.64	1.64	OK		
105	PN RD M14.1	PN RD M14.2	0	1	H		15	15.00	2.824	2.788	1.86	1.86	2.25	0.049	0.000	0.049	8	200	203	DWC	417	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	1.72		1.64	1.10	1.15	OK		
106	PN RD M14.2	PN RD M14.3	1	1	C		26	41.00	2																																

Sl. No.	Man Holes				Ma nho le Typ e	MANH OLE TYPE	Length in m	CUMULATI VE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Check Velocity (> 0.6m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW1+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)/m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole		
146	1CR RD M4	1CR RD M3	0	1	H		15	15.00	2.224	1.977	1.86	1.86	2.25	0.049	0.000	0.049	8	200	203	DWC	61	61	0.010	1.74	54.70	0.00	0.30	0.07	OK	0.52	OK	0.25	0.00	1.12		0.87	1.10	1.11	OK		
147	1CR RD M3	1CR RD M2	1	1	C		21	36.00	1.977	2.256	2.61	4.47	2.25	0.116	0.000	0.116	13	200	203	DWC	-75	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	0.87		0.75	1.11	1.51	OK		
148	1CR RD M2	1CR RD M1	1	1	C		30	66.00	2.256	2.292	3.73	8.20	2.25	0.214	0.000	0.214	17	200	203	DWC	-833	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.75		0.58	1.51	1.71	OK		
149	1CR RD M1	VT RD M14	1	1	C		30	96.00	2.292	2.300	3.73	11.93	2.25	0.311	0.000	0.311	20	200	203	DWC	-3750	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.58		0.41	1.71	1.89	OK		
150	VT RD M14	VT RD M15	2	1	J		30	1465.00	2.300	2.233	3.73	182.04	2.25	4.741	0.000	4.741	78	200	203	DWC	448	520	0.010	0.60	18.73	0.25	0.84	0.35	OK	0.50	OK	0.06	0.00	-0.38	-0.38	-0.44	2.68	2.67	OK		
151	VT RD M15	VT RD M16	1	1	C		30	1495.00	2.233	2.107	3.73	185.77	2.25	4.838	0.000	4.838	79	200	203	DWC	238	520	0.010	0.60	18.73	0.26	0.84	0.35	OK	0.50	OK	0.06	0.00	-0.44		-0.50	2.67	2.61	OK		
152	VT RD M16	VT RD M17	1	1	C		21	1516.00	2.107	2.209	2.61	188.38	2.25	4.906	0.000	4.906	80	200	203	DWC	-206	520	0.010	0.60	18.73	0.26	0.84	0.35	OK	0.50	OK	0.04	0.00	-0.50		-0.54	2.61	2.75	OK		
153	TY LN RD M6	TY LN RD M5	0	1	H		30	30.00	2.114	2.255	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	-213	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.01		0.84	1.10	1.42	OK		
154	TY LN RD M5	TY LN RD M4	1	1	C		30	60.00	2.255	2.395	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	-214	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.84		0.67	1.42	1.73	OK		
155	TY LN RD M4	TY LN RD M3	1	1	C		28	88.00	2.395	2.394	3.48	10.94	2.25	0.285	0.000	0.285	20	200	203	DWC	28000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	0.67		0.51	1.73	1.88	OK		
156	TY LN RD M3	TY LN RD M2	1	1	C		15	103.00	2.394	2.425	1.86	12.80	2.25	0.333	0.000	0.333	21	200	203	DWC	-484	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	0.51		0.43	1.88	2.00	OK		
157	TY LN RD M2	TY LN RD M1	1	1	C		25	128.00	2.425	2.428	3.11	15.91	2.25	0.414	0.000	0.414	23	200	203	DWC	-8333	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	0.43		0.29	2.00	2.14	OK		
158	TY LN RD M1	VT RD M17	1	1	C		30	158.00	2.428	2.209	3.73	19.63	2.25	0.511	0.000	0.511	26	200	203	DWC	137	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.29		0.20	2.14	2.01	OK		
159	VT RD M17	VT RD M18	2	1	J		22	1696.00	2.209	2.132	2.73	210.75	2.25	5.488	0.000	5.488	84	200	203	DWC	286	520	0.010	0.60	18.73	0.29	0.87	0.38	OK	0.52	OK	0.04	0.00	-0.54	-0.54	-0.58	2.75	2.71	OK		
160	SQ RD M2	SQ RD M3	0	1	H		30	30.00	3.034	2.989	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	667	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.93		1.76	1.10	1.23	OK		
161	SQ RD M3	SQ RD M4	1	1	C		30	60.00	2.989	2.941	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	625	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.76		1.59	1.23	1.35	OK		
162	SQ RD M4	SQ RD M5	1	1	C		30	90.00	2.941	2.739	3.73	11.18	2.25	0.291	0.000	0.291	20	200	203	DWC	149	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.59		1.42	1.35	1.32	OK		
163	SQ RD M5	SQ RD M6	1	1	C		30	120.00	2.739	2.538	3.73	14.91	2.25	0.388	0.000	0.388	23	200	203	DWC	149	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.42		1.25	1.32	1.29	OK		
164	SQ RD M6	SQ RD M7	1	1	C		17	137.00	2.538	2.351	2.11	17.02	2.25	0.443	0.000	0.443	24	200	203	DWC	91	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	1.25		1.16	1.29	1.19	OK		
165	SQ RD M11	SQ RD M10	0	1	H		37	37.00	3.332	2.314	4.60	4.60	2.25	0.120	0.000	0.120	13	200	203	DWC	36	36	0.010	2.26	71.20	0.00	0.30	0.07	OK	0.68	OK	1.03	0.00	2.23		1.20	1.10	1.11	OK		
166	SQ RD M10	SQ RD M9	1	1	C		35	72.00	2.314	2.302	4.35	8.95	2.25	0.233	0.000	0.233	18	200	203	DWC	2917	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	1.20		1.01	1.11	1.29	OK		
167	SQ RD M9	SQ RD M8	1	1	C		30	102.00	2.302	2.326	3.73	12.67	2.25	0.330	0.000	0.330	21	200	203	DWC	-1250	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.01		0.84	1.29	1.49	OK		
168	SQ RD M8	SQ RD M7	1	1	C		30	132.00	2.326	2.351	3.73	16.40	2.25	0.427	0.000	0.427	24	200	203	DWC	-1200	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.84		0.67	1.49	1.68	OK		
169	SQ RD M7	PY RD M1	2	1	J		30	299.00	2.351	2.264	3.73	37.15	2.25	0.968	0.000	0.968	36	200	203	DWC	345	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	0.67	0.67	0.61	1.68	1.65	OK		
170	PY RD M1	PY RD M2	1	1	C		30	329.00	2.264	2.291	3.73	40.88	2.25	1.065	0.000	1.065	37	200	203	DWC	-1111	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	0.61		0.55	1.65	1.74	OK		
171	PY RD M2	PY RD M3	1	1	C		30	359.00	2.291	2.201	3.73	44.61	2.25	1.162	0.000	1.162	39	200	203	DWC	333	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	0.55		0.49	1.74	1.71	OK		
172	PY RD M3.2	PY RD M3.1	0	1	H		17	17.00	1.890	1.630	2.11	2.11	2.25	0.055	0.000	0.055	9	200	203	DWC	65	65	0.010	1.68	52.99	0.00	0.30	0.07	OK	0.51	OK	0.26	0.00	0.79		0.53	1.10	1.10	OK		
173	PY RD M3.1	PY RD M3	1	1	C		30	47.00	1.630	2.201	3.73	5.84	2.25	0.152	0.000	0.152	14	200	203	DWC	-53	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.53		0.36	1.10	1.84	OK		
174	PY RD M3	PY RD M4	2	1	J		11	417.00	2.201	2.229	1.37	51.82	2.25	1.349	0.000	1.349	42	200	203	DWC	-393	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.02	0.00	0.36	0.36	0.34	1.84	1.89	OK		
175	PY RD M4	PY RD M5	1	1	C		20	437.00	2.229	2.294	2.49	54.30	2.25	1.414	0.000	1.414	43	200	203	DWC	-308	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.04	0.00	0.34		0.30	1.89	1.99	OK		
176	PY RD M5	VT RD M18	1	1	C		30	467.00	2.294	2.132	3.73	58.03	2.25	1.511	0.000	1.511	44	200	203	DWC	185	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	0.30		0.24	1.99	1.89	OK		
177	VT RD M18	VT RD M19	2	1	J		30	2193.00	2.132	2.170	3.73	272.51	2.25	7.097	0.000	7.097	96	200	203	DWC	-789	520	0.010	0.60	18.73	0.38	0.93	0.43	OK	0.55	OK	0.06	0.00	-0.58	-0.58	-0.64	2.71	2.81	OK		
178	VT RD M19	VT RD M20	1	1	C		30	2223.00	2.170	2.143	3.73	276.23	2.25	7.194	0.000	7.194	96	200	203	DWC	1111	520	0.010	0.60	18.73	0.38	0.93	0.43	OK	0.55	OK	0.06	0.00	-0.64		-0.70	2.81	2.84	OK		
179	VT RD M20	VT RD M21	1	1	C		30	2253.00	2.143	2.094	3.73	279.96	2.25	7.291	0.000	7.291	97	200	203	DWC	612	520	0.010	0.60	18.73	0.39	0.94	0.44	OK	0.56	OK	0.06	0.00	-0.70		-0.76	2.84	2.85	OK		
180	VT RD M21	VT RD M22	1	1	C		26	2279.00	2.094	2.115	3.23	283.19	2.25	7.375																											

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in 1	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Check Velocity (> 0.6m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW1+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)/m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s				From	To	Starting Manhole	Ending manhole			
220	CKV LN RD M4	CKV LN RD M5	1	1	C		19		3281.00	0.710	0.722	2.36	407.70	2.25	10.617	0.000	10.617	117	200	203	DWC	-1583	520	0.010	0.60	18.73	0.57	1.03	0.54	OK	0.61	OK	0.04	0.00	-1.38		-1.42	2.09	2.14	OK	
221	CKV LN RD M5	CKV LN RD M6	1	1	C		30		3311.00	0.722	0.757	3.73	411.43	2.25	10.714	0.000	10.714	117	200	203	DWC	-857	520	0.010	0.60	18.73	0.57	1.03	0.54	OK	0.61	OK	0.06	0.00	-1.42		-1.48	2.14	2.24	OK	
222	CKV LN RD M6	CKV LN RD M7	1	1	C		30		3341.00	0.757	0.762	3.73	415.16	2.25	10.811	0.000	10.811	118	200	203	DWC	-6000	520	0.010	0.60	18.73	0.58	1.03	0.55	OK	0.61	OK	0.06	0.00	-1.48		-1.54	2.24	2.30	OK	
223	CKV LN RD M7	CKV LN RD M7.1	2	1	J		10		5827.00	0.762	0.764	1.24	724.08	2.25	18.856	0.000	18.856	155	300	304	DWC	-5000	870	0.010	0.60	42.70	0.44	0.98	0.47	OK	0.59	OK	0.01	0.00	-2.48	-2.48	-2.49	3.24	3.25	OK	
224	CKV LN RD M7.1	MPK LN RD M4	1	1	C		21		5848.00	0.764	0.763	2.61	726.69	2.25	18.924	0.000	18.924	156	300	304	DWC	21000	870	0.010	0.60	42.70	0.44	0.98	0.47	OK	0.59	OK	0.02	0.00	-2.49		-2.51	3.25	3.27	OK	
225	YS RD M13	YS RD M12	0	1	H		30		30.00	2.034	1.947	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	345	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.93		0.76	1.10	1.19	OK	
226	YS LN1 RD M3	YS LN1 RD M2	0	1	H		25		25.00	0.820	0.927	3.11	3.11	2.25	0.081	0.000	0.081	11	200	203	DWC	-234	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	-0.28		-0.42	1.10	1.35	OK	
227	YS LN1 RD M2	YS LN1 RD M1	1	1	C		30		55.00	0.927	1.084	3.73	6.83	2.25	0.178	0.000	0.178	16	200	203	DWC	-191	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.42		-0.59	1.35	1.67	OK	
228	YS LN1 RD M1	YS RD M12	1	1	C		30		85.00	1.084	1.947	3.73	10.56	2.25	0.275	0.000	0.275	19	200	203	DWC	-35	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.59		-0.76	1.67	2.71	OK	
229	YS RD M12	YS RD M11	2	1	J		23		138.00	1.947	1.910	2.86	17.15	2.25	0.447	0.000	0.447	24	200	203	DWC	622	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	-0.76	-0.76	-0.89	2.71	2.80	OK	
230	YS RD M11	YS RD M10	1	1	C		30		168.00	1.910	1.786	3.73	20.88	2.25	0.544	0.000	0.544	27	200	203	DWC	242	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	-0.89		-0.96	2.80	2.75	OK	
231	YS LN2 RD M2	YS LN2 RD M1	0	1	H		35		35.00	0.534	0.705	4.35	4.35	2.25	0.113	0.000	0.113	13	200	203	DWC	-205	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.19	0.00	-0.57		-0.76	1.10	1.47	OK	
232	YS LN2 RD M1	YS RD M10	1	1	C		30		65.00	0.705	1.786	3.73	8.08	2.25	0.210	0.000	0.210	17	200	203	DWC	-28	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.76		-0.93	1.47	2.72	OK	
233	YS RD M10	YS RD M9	2	1	J		26		259.00	1.780	1.803	3.23	32.18	2.25	0.838	0.000	0.838	33	200	203	DWC	-1130	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	-0.96	-0.96	-1.01	2.74	2.81	OK	
234	YS RD M9	YS LN3 RD M1	1	1	C		23		282.00	1.803	0.931	2.86	35.04	2.25	0.913	0.000	0.913	35	200	203	DWC	26	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	-1.01		-1.05	2.81	1.98	OK	
235	YS LN3 RD M1	YS LN3 RD M2	1	1	C		8		290.00	0.931	0.988	0.99	36.04	2.25	0.938	0.000	0.938	35	200	203	DWC	-140	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.02	0.00	-1.05		-1.07	1.98	2.06	OK	
236	YS LN3 RD M2	YS LN RD M3	1	1	C		33		323.00	0.988	1.046	4.10	40.14	2.25	1.045	0.000	1.045	37	200	203	DWC	-569	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	-1.07		-1.13	2.06	2.18	OK	
237	YS LN RD M3	MT RD M7.4	1	1	C		22		345.00	1.046	0.821	2.73	42.87	2.25	1.116	0.000	1.116	38	200	203	DWC	98	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	-1.13		-1.17	2.18	1.99	OK	
238	MT RD M7.4	MT RD M7.3	1	1	C		30		375.00	0.821	0.831	3.73	46.60	2.25	1.213	0.000	1.213	40	200	203	DWC	-3000	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	-1.17		-1.23	1.99	2.06	OK	
239	MT RD M7.3	MT RD M7.2	1	1	C		18		393.00	0.831	0.734	2.24	48.84	2.25	1.272	0.000	1.272	41	200	203	DWC	186	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.03	0.00	-1.23		-1.26	2.06	1.99	OK	
240	MT RD M7.2	MT RD M7.1	1	1	C		13		406.00	0.734	0.742	1.62	50.45	2.25	1.314	0.000	1.314	41	200	203	DWC	-1625	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.03	0.00	-1.26		-1.29	1.99	2.03	OK	
241	MT RD M7.1	MT RD M7	1	1	C		30		436.00	0.742	0.750	3.73	54.18	2.25	1.411	0.000	1.411	43	200	203	DWC	-3750	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	-1.29		-1.35	2.03	2.10	OK	
242	MT RD M7	MT RD M6	1	1	C		28		464.00	0.750	0.732	3.48	57.66	2.25	1.502	0.000	1.502	44	200	203	DWC	1556	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.05	0.00	-1.35		-1.40	2.10	2.13	OK	
243	MT RD M6	MT RD M5	1	1	C		21		485.00	0.732	0.776	2.61	60.27	2.25	1.569	0.000	1.569	45	200	203	DWC	-477	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.04	0.00	-1.40		-1.44	2.13	2.22	OK	
244	MT RD M5	MT RD M4	1	1	C		6		491.00	0.776	0.735	0.75	61.01	2.25	1.589	0.000	1.589	45	200	203	DWC	146	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.01	0.00	-1.44		-1.45	2.22	2.19	OK	
245	MT RD M4	MT RD M3	1	1	C		30		521.00	0.735	0.782	3.73	64.74	2.25	1.686	0.000	1.686	47	200	203	DWC	-638	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	-1.45		-1.51	2.19	2.29	OK	
246	MT RD M3	MT RD M2	1	1	C		30		551.00	0.782	0.983	3.73	68.47	2.25	1.783	0.000	1.783	48	200	203	DWC	-149	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	-1.51		-1.57	2.29	2.55	OK	
247	MT RD M2	MT RD M1	1	1	C		30		581.00	0.983	0.900	3.73	72.20	2.25	1.880	0.000	1.880	49	200	203	DWC	361	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	-1.57		-1.63	2.55	2.53	OK	
248	MT RD M1	MPK LN RD M4	1	1	C		24		605.00	0.900	0.763	2.98	75.18	2.25	1.958	0.000	1.958	50	200	203	DWC	175	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.05	0.00	-1.63		-1.68	2.53	2.44	OK	
249	MPK LN RD M4	MPK LN RD M3	2	0	J	L	26		6479.00	0.763	0.976	3.23	805.10	2.25	20.966	0.000	20.966	164	250	253	DWC	-122	700	0.010	0.60	29.28	0.72	1.09	0.63	OK	0.65	OK	0.04	0.00	-2.51	-2.51	-2.55	3.27	3.53	OK	
250	MPK LN RD M3L	MPK LN RD M2	0	1	H		30	6479.00	6509.00	0.976	1.923	3.73	808.82	2.25	21.063	0.000	21.063	164	250	253	DWC	-32	700	0.010	0.60	29.28	0.72	1.09	0.63	OK	0.65	OK	0.04	0.00	-0.18		-0.22	1.16	2.14	OK	
251	MPK LN RD M2	MPK LN RD M1	1	1	C		30		6539.00	1.923	1.979	3.73	812.55	2.25	21.160	0.000	21.160	165	250	253	DWC	-536	700	0.010	0.60	29.28	0.72	1.09	0.63	OK	0.65	OK	0.04	0.00	-0.22		-0.26	2.14	2.24	OK	
252	MPK LN RD M1	YS RD M8	1	1	C		30		6569.00	1.979	2.030	3.73	816.28	2.25	21.257	0.000	21.257	165	250	253	DWC	-588	700	0.010	0.60	29.28	0.73	1.09	0.64	OK	0.65	OK	0.04	0.00	-0.26		-0.30	2.24	2.33	OK	
253	YS RD M8	YS RD M7	1	1	C		29		6598.00	2.030	1.895	3.60	819.88	2.25	21.351	0.000	21.351	165	250	253	DWC	215	700	0.010	0.60	29.28	0.73	1.09	0.64	OK	0.65	OK	0.04	0.00	-0.30		-0.34	2.33			

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW1+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)/m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole	
294	VN RD M6.1	VN RD M6.2	0	1	H		19		19.00	1.790	1.751	2.36	2.36	2.25	0.061	0.000	0.061	9	200	203	DWC	487	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.69		0.58	1.10	1.17	OK
295	VN RD M6.2	VN RD M6	1	1	C		30		49.00	1.751	1.768	3.73	6.09	2.25	0.159	0.000	0.159	15	200	203	DWC	-1765	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.58		0.41	1.17	1.36	OK
296	VN RD M6	VN RD M5	3	1	J		30		7798.00	1.768	1.765	3.73	969.00	2.25	25.234	0.000	25.234	180	250	253	DWC	10000	700	0.010	0.60	29.28	0.86	1.12	0.72	OK	0.67	OK	0.04	0.00	-1.36	-1.36	-1.40	3.13	3.17	OK
297	VN RD M5	VN RD M4	1	1	C		21		7819.00	1.765	1.762	2.61	971.61	2.25	25.302	0.000	25.302	180	250	253	DWC	7000	700	0.010	0.60	29.28	0.86	1.12	0.72	OK	0.67	OK	0.03	0.00	-1.40	-1.43	3.17	3.19	OK	
298	VNJ RD M16	VNJ RD M15	0	1	H		30		30.00	1.900	1.898	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	15000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.80		0.63	1.10	1.27	OK
299	VNJ RD M15	VNJ RD M14	1	1	C		30		60.00	1.890	1.824	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	455	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.63		0.46	1.26	1.36	OK
300	VNJ RD M14	VNJ RD M13	1	1	C		12		72.00	1.824	1.703	1.49	8.95	2.25	0.233	0.000	0.233	18	200	203	DWC	99	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	0.46		0.39	1.36	1.31	OK
301	VNJ RD M13	VNJ RD M12	1	1	C		11		83.00	1.703	1.674	1.37	10.31	2.25	0.269	0.000	0.269	19	200	203	DWC	379	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	0.39		0.33	1.31	1.34	OK
302	VNJ RD M12	VNJ RD M11	1	1	C		24		107.00	1.674	1.646	2.98	13.30	2.25	0.346	0.000	0.346	22	200	203	DWC	857	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	0.33		0.20	1.34	1.45	OK
303	VNJ RD M11	VNJ RD M10	1	1	C		16		123.00	1.646	1.617	1.99	15.28	2.25	0.398	0.000	0.398	23	200	203	DWC	552	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	0.20		0.11	1.45	1.51	OK
304	VNJ RD M10	VNJ RD M9	1	1	C		20		143.00	1.617	1.589	2.49	17.77	2.25	0.463	0.000	0.463	25	200	203	DWC	714	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.11		0.00	1.51	1.59	OK
305	VNJ RD M9	VNJ RD M8	1	1	C		30		173.00	1.589	1.688	3.73	21.50	2.25	0.560	0.000	0.560	27	200	203	DWC	-303	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.00		-0.07	1.59	1.76	OK
306	VNJ RD M8	VNJ RD M7	1	1	C		12		185.00	1.688	1.762	1.49	22.99	2.25	0.599	0.000	0.599	28	200	203	DWC	-162	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.03	0.00	-0.07		-0.10	1.76	1.86	OK
307	VNJ RD M2	VNJ RD M3	0	1	H		30		30.00	2.220	1.792	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	70	70	0.010	1.62	51.06	0.00	0.30	0.07	OK	0.49	OK	0.43	0.00	1.12		0.69	1.10	1.10	OK
308	VNJ RD M3	VNJ RD M4	1	1	C		30		60.00	1.792	1.577	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	140	139	0.010	1.15	36.24	0.01	0.30	0.07	OK	0.35	OK	0.22	0.00	0.69		0.47	1.10	1.11	OK
309	VNJ RD M4	VNJ RD M5	1	1	C		16		76.00	1.577	1.661	1.99	9.44	2.25	0.246	0.000	0.246	18	200	203	DWC	-190	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	0.47		0.38	1.11	1.28	OK
310	VNJ RD M5	VNJ RD M6	1	1	C		30		106.00	1.661	1.753	3.73	13.17	2.25	0.343	0.000	0.343	21	200	203	DWC	-326	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.38		0.21	1.28	1.54	OK
311	VNJ RD M6	VN RD M4	1	1	C		30		136.00	1.753	1.762	3.73	16.90	2.25	0.440	0.000	0.440	24	200	203	DWC	-3333	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.21		0.04	1.54	1.72	OK
312	VN RD M4	VN RD M3	3	1	J		30		8170.00	1.762	1.722	3.73	1015.22	2.25	26.438	0.000	26.438	184	250	253	DWC	750	700	0.010	0.60	29.28	0.90	1.13	0.74	OK	0.67	OK	0.04	0.00	-1.43	-1.43	-1.47	3.19	3.19	OK
313	VN RD M3	VN RD M2	1	1	C		30		8200.00	1.722	1.793	3.73	1018.95	2.25	26.535	0.000	26.535	184	250	253	DWC	-423	700	0.010	0.60	29.28	0.91	1.13	0.75	OK	0.67	OK	0.04	0.00	-1.47		-1.51	3.19	3.30	OK
314	VN RD M2	VN RD M1	1	1	C		30		8230.00	1.793	1.865	3.73	1022.68	2.25	26.632	0.000	26.632	185	250	253	DWC	-417	700	0.010	0.60	29.28	0.91	1.13	0.75	OK	0.67	OK	0.04	0.00	-1.51		-1.55	3.30	3.42	OK
315	VN RD M1	AP RD M1	1	1	C		15		8245.00	1.865	2.011	1.86	1024.54	2.25	26.681	0.000	26.681	185	250	253	DWC	-103	700	0.010	0.60	29.28	0.91	1.13	0.75	OK	0.67	OK	0.02	0.00	-1.55		-1.57	3.42	3.58	OK
316	AP RD M6	AP RD M5	0	1	H		19		19.00	2.050	2.053	2.36	2.36	2.25	0.061	0.000	0.061	9	200	203	DWC	-6333	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.95		0.84	1.10	1.21	OK
317	AP RD M5	AP RD M4	1	1	C		37		56.00	2.053	2.039	4.60	6.96	2.25	0.181	0.000	0.181	16	200	203	DWC	2643	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.21	0.00	0.84		0.63	1.21	1.41	OK
318	AP RD M4	AP RD M3	1	1	C		30		86.00	2.039	2.026	3.73	10.69	2.25	0.278	0.000	0.278	19	200	203	DWC	2308	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.63		0.46	1.41	1.57	OK
319	AP RD M3	AP RD M2	1	1	C		30		116.00	2.030	2.017	3.73	14.41	2.25	0.375	0.000	0.375	22	200	203	DWC	2308	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.46		0.29	1.57	1.73	OK
320	AP RD M2	AP RD M1	1	1	C		30		146.00	2.017	2.011	3.73	18.14	2.25	0.472	0.000	0.472	25	200	203	DWC	5000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.29		0.12	1.73	1.89	OK
321	AP RD M1	PNL RD M14	2	1	J		37		8428.00	2.011	1.898	4.60	1047.28	2.25	27.273	0.000	27.273	187	250	253	DWC	327	700	0.010	0.60	29.28	0.93	1.14	0.77	OK	0.68	OK	0.05	0.00	-1.57	-1.57	-1.62	3.58	3.52	OK
322	KV RD M10	KV RD M11	0	1	H		30		30.00	2.163	2.146	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	1765	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.06		0.89	1.10	1.26	OK
323	KV RD M11	KV RD M12	1	1	C		22		52.00	2.146	2.223	2.73	6.46	2.25	0.168	0.000	0.168	15	200	203	DWC	-286	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	0.89		0.77	1.26	1.45	OK
324	KV RD M1	KV RD M2	0	1	H		30		30.00	2.432	2.357	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	400	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.33		1.16	1.10	1.20	OK
325	KV RD M2	KV RD M3	1	1	C		25		55.00	2.357	2.258	3.11	6.83	2.25	0.178	0.000	0.178	16	200	203	DWC	253	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	1.16		1.02	1.20	1.24	OK
326	KV RD M3	KV RD M4	1	1	C		27		82.00	2.258	1.500	3.36	10.19	2.25	0.265	0.000	0.265	19	200	203	DWC	36	43	0.010	2.07	65.15	0.00	0.30	0.07	OK	0.62	OK	0.63	0.00	1.02		0.39	1.24	1.11	OK
327	TK LN RD M6	TK LN RD M5	0	1	H		30		30.00	2.244	2.141	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	291	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.14		0.97	1.10	1.17	OK
328	TK LN RD M5	TK LN RD M4	1	1	C		30		60.00	2.141	2.114	3.73																												

Sl. No.	Man Holes				Ma nho le Typ e	MANH OLE TYPE	Length in m	CUMULATI VE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Check Velocity (> 0.6m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW1+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)/m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole		
368	PC RD M9	PC RD M10	0	1	H		30	30.00	2.200	2.280	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	-375	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.10		0.93	1.10	1.35	OK		
369	PC RD M10	PC RD M11	1	1	C		15	45.00	2.280	2.385	1.86	5.59	2.25	0.146	0.000	0.146	14	200	203	DWC	-143	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.93		0.85	1.35	1.54	OK		
370	PC RD M11	PC RD M12	1	1	C		30	75.00	2.385	2.388	3.73	9.32	2.25	0.243	0.000	0.243	18	200	203	DWC	-10000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.85		0.68	1.54	1.71	OK		
371	PC RD M12	PC RD M13	1	1	C		30	105.00	2.384	2.380	3.73	13.05	2.25	0.340	0.000	0.340	21	200	203	DWC	7500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.68		0.51	1.70	1.87	OK		
372	PC RD M13	PC RD M14	1	1	C		30	135.00	2.380	2.345	3.73	16.78	2.25	0.437	0.000	0.437	24	200	203	DWC	857	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.51		0.34	1.87	2.01	OK		
373	PC RD M14	PC RD M15	1	1	C		27	162.00	2.345	2.321	3.36	20.13	2.25	0.524	0.000	0.524	26	200	203	DWC	1125	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	0.34		0.26	2.01	2.06	OK		
374	PC RD M15	TK LN RD M7.3	1	1	C		30	192.00	2.321	2.249	3.73	23.86	2.25	0.621	0.000	0.621	29	200	203	DWC	417	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.26		0.19	2.06	2.06	OK		
375	TK LN RD M7.3	TK LN RD M7.2	1	1	C		30	222.00	2.249	2.177	3.73	27.59	2.25	0.718	0.000	0.718	31	200	203	DWC	417	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.19		0.13	2.06	2.05	OK		
376	TK LN RD M7.2	TK LN RD M7.1	1	1	C		30	252.00	2.177	2.112	3.73	31.31	2.25	0.815	0.000	0.815	33	200	203	DWC	462	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.13		0.07	2.05	2.04	OK		
377	TK LN RD M7.1	TK LN RD M7	1	1	C		21	273.00	2.112	2.364	2.61	33.92	2.25	0.883	0.000	0.883	34	200	203	DWC	-83	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	0.07		0.03	2.04	2.33	OK		
378	TK LN RD M7	KV RD M17A	1	1	C		40	313.00	2.364	2.418	4.97	38.89	2.25	1.013	0.000	1.013	36	200	203	DWC	-741	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.08	0.00	0.03		-0.05	2.33	2.47	OK		
379	KV RD M17A	KV RD M17	1	1	C		30	343.00	2.418	2.351	3.73	42.62	2.25	1.110	0.000	1.110	38	200	203	DWC	448	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	-0.05		-0.11	2.47	2.46	OK		
380	KV RD M17	PN RD M1	2	1	J		22	1467.00	2.351	2.373	2.73	182.29	2.25	4.747	0.000	4.747	78	200	203	DWC	-1000	520	0.010	0.60	18.73	0.25	0.84	0.35	OK	0.50	OK	0.04	0.00	-0.62	-0.62	-0.66	2.97	3.03	OK		
381	PN RD M1.1	PN RD M1.2	0	1	H		30	30.00	2.604	2.410	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	155	155	0.010	1.09	34.32	0.00	0.30	0.07	OK	0.33	OK	0.19	0.00	1.50		1.31	1.10	1.10	OK		
382	PN RD M1.2	PN RD M1	1	1	C		33	63.00	2.410	2.829	4.10	7.83	2.25	0.204	0.000	0.204	17	200	203	DWC	-79	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	1.31		1.13	1.10	1.70	OK		
383	PN RD M1	PN RD M2	2	1	J		23	1553.00	2.829	2.557	2.86	192.98	2.25	5.026	0.000	5.026	81	200	203	DWC	85	520	0.010	0.60	18.73	0.27	0.85	0.36	OK	0.51	OK	0.04	0.00	-0.66	-0.66	-0.70	3.49	3.26	OK		
384	PN RD M2	PN RD M3	1	1	C		19	1572.00	2.557	2.664	2.36	195.34	2.25	5.087	0.000	5.087	81	200	203	DWC	-178	520	0.010	0.60	18.73	0.27	0.85	0.36	OK	0.51	OK	0.04	0.00	-0.70		-0.74	3.26	3.40	OK		
385	PN RD M3	PN RD M4	1	1	C		30	1602.00	2.664	3.413	3.73	199.07	2.25	5.184	0.000	5.184	82	200	203	DWC	-40	520	0.010	0.60	18.73	0.28	0.86	0.37	OK	0.51	OK	0.06	0.00	-0.74		-0.80	3.40	4.21	OK		
386	PN RD M4.1	PN RD M4.2	0	1	H		30	30.00	3.394	2.829	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	53	53	0.010	1.86	58.68	0.00	0.30	0.07	OK	0.56	OK	0.57	0.00	2.29		1.72	1.10	1.11	OK		
387	PN RD M4.2	PN RD M4	1	1	C		24	54.00	2.829	3.413	2.98	6.71	2.25	0.175	0.000	0.175	15	200	203	DWC	-41	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	1.72		1.59	1.11	1.82	OK		
388	PN RD M4	PN RD M5	2	1	J		27	1683.00	3.413	3.253	3.36	209.13	2.25	5.446	0.000	5.446	84	200	203	DWC	169	520	0.010	0.60	18.73	0.29	0.87	0.38	OK	0.52	OK	0.05	0.00	-0.80	-0.80	-0.85	4.21	4.10	OK		
389	PN RD M5	PN RD M6	1	1	C		30	1713.00	3.253	3.092	3.73	212.86	2.25	5.543	0.000	5.543	85	200	203	DWC	186	520	0.010	0.60	18.73	0.30	0.88	0.38	OK	0.52	OK	0.06	0.00	-0.85		-0.91	4.10	4.00	OK		
390	PN RD M6	PN RD M7	1	1	C		30	1743.00	3.092	2.932	3.73	216.59	2.25	5.640	0.000	5.640	85	200	203	DWC	187	520	0.010	0.60	18.73	0.30	0.88	0.38	OK	0.52	OK	0.06	0.00	-0.91		-0.97	4.00	3.90	OK		
391	PN RD M7	PN RD M8	1	1	C		30	1773.00	2.932	2.771	3.73	220.32	2.25	5.737	0.000	5.737	86	200	203	DWC	187	520	0.010	0.60	18.73	0.31	0.88	0.39	OK	0.52	OK	0.06	0.00	-0.97		-1.03	3.90	3.80	OK		
392	PN RD M8	ST RD M7.9	1	1	C		35	1808.00	2.771	2.688	4.35	224.67	2.25	5.851	0.000	5.851	87	200	203	DWC	422	520	0.010	0.60	18.73	0.31	0.88	0.39	OK	0.52	OK	0.07	0.00	-1.03		-1.10	3.80	3.79	OK		
393	ST RD M7.9	ST RD M7.8	1	1	C		30	1838.00	2.688	2.605	3.73	228.39	2.25	5.948	0.000	5.948	88	200	203	DWC	361	520	0.010	0.60	18.73	0.32	0.89	0.40	OK	0.53	OK	0.06	0.00	-1.10		-1.16	3.79	3.77	OK		
394	ST RD M7.8	ST RD M7.7	1	1	C		30	1868.00	2.605	2.510	3.73	232.12	2.25	6.045	0.000	6.045	88	200	203	DWC	316	520	0.010	0.60	18.73	0.32	0.89	0.40	OK	0.53	OK	0.06	0.00	-1.16		-1.22	3.77	3.73	OK		
395	ST RD M7.7	ST RD M7.6	1	1	C		30	1898.00	2.510	2.432	3.73	235.85	2.25	6.142	0.000	6.142	89	200	203	DWC	385	520	0.010	0.60	18.73	0.33	0.90	0.40	OK	0.54	OK	0.06	0.00	-1.22		-1.28	3.73	3.71	OK		
396	ST RD M7.6	ST RD M7.5	1	1	C		29	1927.00	2.432	2.352	3.60	239.45	2.25	6.236	0.000	6.236	90	200	203	DWC	363	520	0.010	0.60	18.73	0.33	0.90	0.40	OK	0.54	OK	0.06	0.00	-1.28		-1.34	3.71	3.69	OK		
397	ST RD M7.5	ST RD M7.4	1	1	C		30	1957.00	2.352	2.252	3.73	243.18	2.25	6.333	0.000	6.333	90	200	203	DWC	300	520	0.010	0.60	18.73	0.34	0.91	0.41	OK	0.54	OK	0.06	0.00	-1.34		-1.40	3.69	3.65	OK		
398	ST RD M7.4	ST RD M7.3	1	1	C		33	1990.00	2.252	2.052	4.10	247.28	2.25	6.440	0.000	6.440	91	200	203	DWC	165	520	0.010	0.60	18.73	0.34	0.91	0.41	OK	0.54	OK	0.06	0.00	-1.40		-1.46	3.65	3.51	OK		
399	ST RD M7.3	ST RD M7.2	1	1	C		30	2020.00	2.052	2.102	3.73	251.01	2.25	6.537	0.000	6.537	92	200	203	DWC	-600	520	0.010	0.60	18.73	0.35	0.92	0.41	OK	0.55	OK	0.06	0.00	-1.46		-1.52	3.51	3.62	OK		
400	ST RD M7.2	ST RD M7.1	1	1	C		32	2052.00	2.102	2.032	3.98	254.99	2.25	6.640	0.000	6.640	92	200	203	DWC	457	520	0.010	0.60	18.73	0.35	0.92	0.41	OK	0.55	OK	0.06	0.00	-1.52		-1.58	3.62	3.61	OK		
401	ST RD M7.1	ST RD M7	1	1	C		30	2082.00	2.032	2.317	3.73	258.71	2.25	6.737	0.000	6.737	93	200	203	DWC	-105	520	0.010	0.60	18.73	0.36	0.92	0.42	OK	0.55	OK	0.06	0.00	-1.58		-1.64	3.61	3.96	OK		
402	ST RD M4	ST RD M5	0	1	H		30	30.																																	

Sl. No.	Man Holes				Ma nho le Typ e	MANH OLE TYPE	Length in m	CUMULATI VE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW1+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)/m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s			From		To	Starting Manhole	Ending manhole		
442	PNL RD M2	PNL RD M3	1	1	C		36	83.00	1.805	1.864	4.47	10.31	2.25	0.269	0.000	0.269	19	200	203	DWC	-610	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.20	0.00	0.70		0.50	1.11	1.36	OK	
443	PNL RD M3	PNL RD M4	1	1	C		38	121.00	1.864	1.810	4.72	15.04	2.25	0.392	0.000	0.392	23	200	203	DWC	704	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.21	0.00	0.50		0.29	1.36	1.52	OK	
444	PNL RD M4	PNL RD M5	2	1	J		24	3278.00	1.810	2.194	2.98	407.33	2.25	10.608	0.000	10.608	117	200	203	DWC	-63	520	0.010	0.61	18.73	0.57	1.03	0.54	OK	0.61	OK	0.05	0.00	-2.39	-2.39	-2.44	4.20	4.63	OK	
445	VNJ RD M3.1A	VNJ RD M3A	0	1	H		30	30.00	2.034	2.293	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	-116	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.93		0.76	1.10	1.53	OK	
446	VNJ RD M2A	VNJ RD M3A	0	1	H		23	23.00	2.191	2.293	2.86	2.86	2.25	0.074	0.000	0.074	10	200	203	DWC	-225	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	1.09		0.96	1.10	1.33	OK	
447	VNJ RD M5A	VNJ RD M4A	0	1	H		30	30.00	3.311	2.464	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	35	35	0.010	2.29	72.21	0.00	0.30	0.07	OK	0.69	OK	0.86	0.00	2.21		1.35	1.10	1.11	OK	
448	VNJ RD M4A	VNJ RD M3A	1	1	C		15	45.00	2.464	2.293	1.86	5.59	2.25	0.146	0.000	0.146	14	200	203	DWC	88	88	0.010	1.45	45.54	0.00	0.30	0.07	OK	0.43	OK	0.17	0.00	1.35		1.18	1.11	1.11	OK	
449	VNJ RD M3A	VNJ RD M3.2A	3	1	J		30	128.00	2.293	2.857	3.73	15.91	2.25	0.414	0.000	0.414	23	200	203	DWC	-53	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.76	0.76	0.59	1.53	2.27	OK	
450	VNJ RD M3.2A	VNJ RD M3.3A	1	1	C		30	158.00	2.857	2.403	3.73	19.63	2.25	0.511	0.000	0.511	26	200	203	DWC	66	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.59		0.50	2.27	1.90	OK	
451	VNJ RD M3.3A	VNJ RD M3.4A	1	1	C		24	182.00	2.403	1.949	2.98	22.62	2.25	0.589	0.000	0.589	28	200	203	DWC	53	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	0.50		0.42	1.90	1.53	OK	
452	VNJ RD M3.4A	VNJ RD M3.5A	1	1	C		17	199.00	1.944	1.999	2.11	24.73	2.25	0.644	0.000	0.644	29	200	203	DWC	-309	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	0.42		0.38	1.52	1.62	OK	
453	VNJ RD M3.5A	PNL RD M7A	1	1	C		19	218.00	1.999	2.044	2.36	27.09	2.25	0.705	0.000	0.705	30	200	203	DWC	-422	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	0.38		0.33	1.62	1.71	OK	
454	PNL RD M9A	PNL RD M8A	0	1	H		30	30.00	1.930	1.889	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	732	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.83		0.66	1.10	1.23	OK	
455	PNL RD M8A	PNL RD M7A	1	1	C		30	60.00	1.889	2.044	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	-194	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.66		0.49	1.23	1.55	OK	
456	PNL RD M7A	PNL RD M6	2	1	J		34	312.00	2.044	1.987	4.22	38.77	2.25	1.010	0.000	1.010	36	200	203	DWC	596	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.07	0.00	0.33	0.33	0.26	1.71	1.73	OK	
457	PNL RD M6.2	PNL RD M6.1	0	1	H		20	20.00	1.844	1.922	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	-256	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.74		0.63	1.10	1.29	OK	
458	PNL RD M6.1	PNL RD M6	1	1	C		30	50.00	1.922	1.987	3.73	6.21	2.25	0.162	0.000	0.162	15	200	203	DWC	-462	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.63		0.46	1.29	1.53	OK	
459	PNL RD M6	PNL RD M5	2	1	J		19	381.00	1.987	2.194	2.36	47.34	2.25	1.233	0.000	1.233	40	200	203	DWC	-92	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.04	0.00	0.26	0.26	0.22	1.73	1.97	OK	
460	PNL RD M5	PNL RD M7	2	1	J		20	3679.00	2.194	2.380	2.49	457.16	2.25	11.905	0.000	11.905	124	200	203	DWC	-108	520	0.010	0.60	18.73	0.64	1.06	0.59	OK	0.63	OK	0.04	0.00	-2.44	-2.44	-2.48	4.63	4.86	OK	
461	PNL RD M7	PNL RD M8	1	1	C		36	3715.00	2.380	1.811	4.47	461.63	2.25	12.022	0.000	12.022	124	200	203	DWC	63	520	0.010	0.60	18.73	0.64	1.06	0.59	OK	0.63	OK	0.07	0.00	-2.48		-2.55	4.86	4.36	OK	
462	VN CR RD M1	PNL RD M8	0	1	H		40	40.00	2.074	1.811	4.97	4.97	2.25	0.129	0.000	0.129	13	200	203	DWC	152	152	0.010	1.10	34.65	0.00	0.30	0.07	OK	0.33	OK	0.26	0.00	0.97		0.71	1.10	1.10	OK	
463	PNL RD M8	PNL RD M9	2	1	J		6	3761.00	1.811	1.221	0.75	467.35	2.25	12.171	0.000	12.171	125	200	203	DWC	10	520	0.010	0.60	18.73	0.65	1.06	0.59	OK	0.63	OK	0.01	0.00	-2.55	-2.55	-2.56	4.36	3.78	OK	
464	NA Ln RD M1	NA Ln RD M2	0	1	H		23	23.00	2.010	2.055	2.86	2.86	2.25	0.074	0.000	0.074	10	200	203	DWC	-511	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	0.91		0.78	1.10	1.28	OK	
465	NA Ln RD M2	PNL RD M9	1	1	C		30	53.00	2.055	1.221	3.73	6.59	2.25	0.172	0.000	0.172	15	200	203	DWC	36	45	0.010	2.02	63.69	0.00	0.30	0.07	OK	0.61	OK	0.67	0.00	0.78		0.11	1.28	1.11	OK	
466	PNL RD M9	PNL RD M10	2	1	J		22	3836.00	1.221	1.397	2.73	476.67	2.25	12.413	0.000	12.413	126	200	203	DWC	-125	520	0.010	0.60	18.73	0.66	1.07	0.60	OK	0.64	OK	0.04	0.00	-2.56	-2.56	-2.60	3.78	4.00	OK	
467	PNL RD M10	PNL RD M11	1	1	C		20	3856.00	1.397	1.751	2.49	479.16	2.25	12.478	0.000	12.478	127	200	203	DWC	-56	520	0.010	0.60	18.73	0.67	1.07	0.60	OK	0.64	OK	0.04	0.00	-2.60		-2.64	4.00	4.39	OK	
468	PNL RD M11	PNL RD M12L	1	0	C	L	30	3886.00	1.751	1.928	3.73	482.88	2.25	12.575	0.000	12.575	127	200	203	DWC	-169	520	0.010	0.60	18.73	0.67	1.07	0.60	OK	0.64	OK	0.06	0.00	-2.64		-2.70	4.39	4.63	OK	
469	PNL RD M12	PNL RD M13	0	1	H		30	3886.0	3916.00	1.928	1.917	3.73	486.61	2.25	12.672	0.000	12.672	128	200	203	DWC	2727	520	0.010	0.60	18.73	0.68	1.07	0.61	OK	0.64	OK	0.06	0.00	0.83		0.77	1.10	1.15	FALSE
470	PNL RD M13	PNL RD M14	1	1	C		13	3929.00	1.917	1.898	1.62	488.23	2.25	12.714	0.000	12.714	128	200	203	DWC	684	520	0.010	0.60	18.73	0.68	1.07	0.61	OK	0.64	OK	0.03	0.00	0.77		0.74	1.15	1.16	OK	
471	PNL RD M14	BV RD M1	2	1	J		4	12361.00	1.898	1.922	0.50	1536.01	2.25	40.000	0.000	40.000	226	300	304	DWC	-167	870	0.010	0.60	42.70	0.94	1.14	0.77	OK	0.69	OK	0.00	0.00	-1.62	-1.62	-1.62	3.52	3.54	OK	
472	BV RD M1	BV RD M1.3	1	1	C		19	12380.00	1.922	1.950	2.36	1538.37	2.25	40.062	0.000	40.062	226	300	304	DWC	-679	870	0.010	0.60	42.70	0.94	1.14	0.77	OK	0.69	OK	0.02	0.00	-1.62		-1.64	3.54	3.59	OK	
473	BV RD M1.3	BV RD M1.2	1	1	C		30	12410.00	1.950	1.978	3.73	1542.09	2.25	40.159	0.000	40.159	227	300	304	DWC	-1071	870	0.010	0.60	42.70	0.94	1.14	0.77	OK	0.69	OK	0.03	0.00	-1.64		-1.67	3.59	3.65	OK	
474	BV RD M1.2	BV RD M1.1	1	1	C		30	12440.00	1.978	1.994	3.73	1545.82	2.25	40.256	0.000	40.256	227	300	304	DWC	-1875	870	0.010	0.60	42.70	0.94	1.14	0.77	OK	0.69	OK	0.03	0.00	-1.67		-1.70	3.65	3.69	OK	
475	BV RD M1.1	VN CR RD3 M6	1	1	C		30	12470.00	1.994	1.977	3.73	1549.55	2.25	40.353	0.000	40.353	227	300	304	DWC	1765	870	0.010	0.60	42.70	0.94	1.14	0.77	OK	0.69	OK	0.03	0.00	-1.70		-1.73	3.69	3.71	OK	
476	VN CR RD3 M1																																							

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in 1	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW1+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)/m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s			From		To	Starting Manhole	Ending manhole		
516	KPV RD M58.3	CRG RD M16A	1	1	C		20.00		80.00	2.031	2.307	2.49	9.94	2.25	0.259	0.000	0.259	19	200	203	DWC	-72	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.78		0.67	1.25	1.64	OK
517	CRG RD M16A.1	CRG RD M16A	0	1	H		20.00		20.00	2.320	2.307	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	1538	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.22		1.11	1.10	1.20	OK
518	CRG RD M16A	CRG RD M16	2	1	J		13.00		113.00	2.307	2.173	1.62	14.04	2.25	0.366	0.000	0.366	22	200	203	DWC	97	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	0.67	0.60	1.64	1.57	OK	
519	CRG RD M16	CRG RD M15	2	1	J		26.00		13615.00	2.173	2.136	3.23	1691.83	2.25	44.058	0.000	44.058	237	342	400	HDPE	703	1000	0.010	0.61	56.49	0.78	1.10	0.67	OK	0.68	OK	0.03	0.00	-1.93	-1.930	-1.96	4.10	4.10	OK
520	CRG RD M15.4	CRG RD M15.3	0	1	H		20.00		20.00	2.280	2.221	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	339	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.18		1.07	1.10	1.15	OK
521	CRG RD M15.3	CRG RD M15.2	1	1	C		19.00		39.00	2.221	2.199	2.36	4.85	2.25	0.126	0.000	0.126	13	200	203	DWC	864	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.07		0.96	1.15	1.24	OK
522	CRG RD M15.2	CRG RD M15.1	1	1	C		30.00		69.00	2.199	2.167	3.73	8.57	2.25	0.223	0.000	0.223	17	200	203	DWC	937	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.96		0.79	1.24	1.38	OK
523	CRG RD M15.1	CRG RD M15	1	1	C		30.00		99.00	2.167	2.136	3.73	12.30	2.25	0.320	0.000	0.320	21	200	203	DWC	968	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.79		0.62	1.38	1.52	OK
524	CRG RD M15	CRG RD M14	2	1	J		15.00		13729.00	2.136	2.099	1.86	1706.00	2.25	44.427	0.000	44.427	238	342	400	HDPE	405	1000	0.010	0.61	56.49	0.79	1.10	0.67	OK	0.68	OK	0.02	0.00	-1.96	-1.960	-1.98	4.10	4.08	OK
525	CRG RD M14	CRG RD M13	1	1	C		20.00		13749.00	2.090	2.026	2.49	1708.48	2.25	44.492	0.000	44.492	239	342	400	HDPE	313	1000	0.010	0.61	56.49	0.79	1.10	0.67	OK	0.68	OK	0.02	0.00	-1.98		-2.00	4.07	4.03	OK
526	PNRS RD M6.5	PNRS RD M6.4	0	1	H		30.00		30.00	2.513	2.414	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	303	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.41		1.24	1.10	1.17	OK
527	PNRS RD M6.4	PNRS RD M6.3	1	1	C		30.00		60.00	2.414	2.228	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	161	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.24		1.07	1.17	1.16	OK
528	PNRS RD M6.3	PNRS RD M6.2	1	1	C		30.00		90.00	2.228	2.254	3.73	11.18	2.25	0.291	0.000	0.291	20	200	203	DWC	-1154	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.07		0.90	1.16	1.35	OK
529	PNRS RD M6.2	PNRS RD M6.1	1	1	C		20.00		110.00	2.254	2.186	2.49	13.67	2.25	0.356	0.000	0.356	22	200	203	DWC	294	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.90		0.79	1.35	1.40	OK
530	PNRS RD M6.1	PNRS RD M6	1	1	C		26.00		136.00	2.186	2.228	3.23	16.90	2.25	0.440	0.000	0.440	24	200	203	DWC	-619	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	0.79		0.65	1.40	1.58	OK
531	PNRS RD M11.13	PNRS RD M11.12	0	1	H		30.00		30.00	2.704	2.524	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	167	167	0.010	1.05	33.06	0.00	0.30	0.07	OK	0.32	OK	0.18	0.00	1.60		1.42	1.10	1.10	OK
532	PNRS RD M11.12	PNRS RD M11.11	1	1	C		30.00		60.00	2.524	2.393	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	229	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.42		1.25	1.10	1.14	OK
533	PNRS RD M11.11	PNRS-PC RD M11.10	1	1	C		30.00		90.00	2.393	2.474	3.73	11.18	2.25	0.291	0.000	0.291	20	200	203	DWC	-370	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.25		1.08	1.14	1.39	OK
534	PNRS-PC RD M11.10	PNRS RD M11.9	1	1	C		20.00		110.00	2.474	2.503	2.49	13.67	2.25	0.356	0.000	0.356	22	200	203	DWC	-690	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.08		0.97	1.39	1.53	OK
535	PNRS RD M11.9	PNRS RD M11.8	1	1	C		30.00		140.00	2.503	2.472	3.73	17.40	2.25	0.453	0.000	0.453	25	200	203	DWC	968	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.97		0.80	1.53	1.67	OK
536	PNRS RD M11.8	PNRS RD M11	1	1	C		19.00		159.00	2.472	2.465	2.36	19.76	2.25	0.515	0.000	0.515	26	200	203	DWC	2714	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	0.80		0.74	1.67	1.73	OK
537	PNRS RD M11.7	PNRS RD M11.6	0	1	H		30.00		30.00	2.534	2.609	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	-400	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.43		1.26	1.10	1.35	OK
538	PNRS RD M11.6	PNRS RD M11.5	1	1	C		30.00		60.00	2.609	2.679	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	-429	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.26		1.09	1.35	1.59	OK
539	PNRS RD M11.5	PNRS RD M11.4	1	1	C		30.00		90.00	2.679	2.674	3.73	11.18	2.25	0.291	0.000	0.291	20	200	203	DWC	6000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.09		0.92	1.59	1.75	OK
540	PNRS RD M11.4	PNRS RD M11.3	1	1	C		30.00		120.00	2.674	2.670	3.73	14.91	2.25	0.388	0.000	0.388	23	200	203	DWC	7500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.92		0.75	1.75	1.92	OK
541	PNRS RD M11.3	PNRS RD M11.2	1	1	C		23.00		143.00	2.670	2.659	2.86	17.77	2.25	0.463	0.000	0.463	25	200	203	DWC	2091	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.13	0.00	0.75		0.62	1.92	2.04	OK
542	PNRS RD M11.2	PNRS RD M11.1	1	1	C		25.00		168.00	2.659	2.620	3.11	20.88	2.25	0.544	0.000	0.544	27	200	203	DWC	641	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	0.62		0.54	2.04	2.08	OK
543	PNRS RD M11.1	PNRS RD M11	1	1	C		15.00		183.00	2.620	2.465	1.86	22.74	2.25	0.592	0.000	0.592	28	200	203	DWC	97	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	0.54		0.50	2.08	1.97	OK
544	PNRS RD M11	PNRS RD M10	2	1	J		30.00		372.00	2.465	2.364	3.73	46.23	2.25	1.204	0.000	1.204	40	200	203	DWC	297	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	0.50	0.500	0.44	1.97	1.92	OK
545	PNRS RD M10	PNRS RD M9	1	1	C		30.00		402.00	2.364	2.415	3.73	49.95	2.25	1.301	0.000	1.301	41	200	203	DWC	-588	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	0.44		0.38	1.92	2.04	OK
546	PNRS RD M9	PNRS RD M8	1	1	C		30.00		432.00	2.415	2.280	3.73	53.68	2.25	1.398	0.000	1.398	43	200	203	DWC	222	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	0.38		0.32	2.04	1.96	OK
547	PNRS RD M8	10BCR-PNAS RD M1	1	1	C		30.00		462.00	2.280	2.196	3.73	57.41	2.25	1.495	0.000	1.495	44	200	203	DWC	357	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	0.32		0.26	1.96	1.94	OK
548	10BCR RD M10	10BCR RD M9	0	1	H		30.00		30.00	2.704	2.606	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	306	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.60		1.43	1.10	1.18	OK
549	10BCR RD M9	10BCR RD M8	1	1	C		26.00		56.00	2.606	2.695	3.23	6.96	2.25	0.181	0.000	0.181	16	200	203	DWC	-292																		

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in 1	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW1+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)/m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole	
590	KCJ RD M4	KCJ RD M3	1	1	C		30.00		135.00	2.405	2.391	3.73	16.78	2.25	0.437	0.000	0.437	24	200	203	DWC	2143	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.70		0.53	1.71	1.86	OK
591	KCJ RD M3	KCJ-8CRSA RD M2	1	1	C		24.00		159.00	2.391	2.367	2.98	19.76	2.25	0.515	0.000	0.515	26	200	203	DWC	1000	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	0.53		0.45	1.86	1.92	OK
592	KCJ-8CRSA RD M2	KCJ RD M1	2	1	J		30.00		599.00	2.367	2.391	3.73	74.43	2.25	1.938	0.000	1.938	50	200	203	DWC	-1250	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	0.14	0.140	0.08	2.23	2.31	OK
593	KCJ RD M1	KCJ-PNRS RD M1	1	1	C		17.00		616.00	2.391	2.415	2.11	76.55	2.25	1.993	0.000	1.993	51	200	203	DWC	-708	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.03	0.00	0.08		0.05	2.31	2.37	OK
594	KCJ-PNRS RD M1	PNRS RD M2	1	1	C		17.00		633.00	2.415	2.360	2.11	78.66	2.25	2.048	0.000	2.048	52	200	203	DWC	309	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.03	0.00	0.05		0.02	2.37	2.34	OK
595	PNRS RD M2	PNRS RD M3	1	1	C		20.00		653.00	2.360	2.250	2.49	81.14	2.25	2.113	0.000	2.113	52	200	203	DWC	182	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.04	0.00	0.02		-0.02	2.34	2.27	OK
596	PNRS RD M3	PNRS-10CR RD M4	1	1	C		30.00		683.00	2.250	2.196	3.73	84.87	2.25	2.210	0.000	2.210	54	200	203	DWC	556	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	-0.02		-0.08	2.27	2.28	OK
597	10CR-PNRS RD M8	10CR RD M7	0	1	H		20.00		20.00	2.434	2.394	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.33		1.22	1.10	1.17	OK
598	10CR RD M7	10CR RD M6	1	1	C		20.00		40.00	2.394	2.354	2.49	4.97	2.25	0.129	0.000	0.129	13	200	203	DWC	500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.22		1.11	1.17	1.24	OK
599	10CR RD M6	10CR RD M5	1	1	C		30.00		70.00	2.354	2.637	3.73	8.70	2.25	0.227	0.000	0.227	17	200	203	DWC	-106	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.11		0.94	1.24	1.70	OK
600	10CR RD M5	10CR RD M4	1	1	C		30.00		100.00	2.637	2.522	3.73	12.43	2.25	0.324	0.000	0.324	21	200	203	DWC	261	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.94		0.77	1.70	1.75	OK
601	10CR RD M4	10CR RD M3	1	1	C		30.00		130.00	2.522	2.504	3.73	16.15	2.25	0.421	0.000	0.421	24	200	203	DWC	1667	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.77		0.60	1.75	1.90	OK
602	10CR RD M3	10CR RD M2	1	1	C		30.00		160.00	2.504	2.407	3.73	19.88	2.25	0.518	0.000	0.518	26	200	203	DWC	309	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.60		0.51	1.90	1.90	OK
603	10CR RD M2	10CR RD M1	1	1	C		30.00		190.00	2.407	2.314	3.73	23.61	2.25	0.615	0.000	0.615	28	200	203	DWC	323	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.51		0.44	1.90	1.87	OK
604	10CR RD M1	PNRS-10CR RD M4	1	1	C		19.00		209.00	2.314	2.196	2.36	25.97	2.25	0.676	0.000	0.676	30	200	203	DWC	161	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	0.44		0.40	1.87	1.80	OK
605	PNRS-10CR RD M4	PNRS RD M5	2	1	J		12.00		904.00	2.196	2.118	1.49	112.33	2.25	2.925	0.000	2.925	62	200	203	DWC	154	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.02	0.00	-0.08	-0.080	-0.10	2.28	2.22	OK
606	PNRS RD M5	PNRS RD M6	1	1	C		30.00		934.00	2.118	2.228	3.73	116.06	2.25	3.022	0.000	3.022	63	200	203	DWC	-273	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.06	0.00	-0.10		-0.16	2.22	2.39	OK
607	PNRS RD M6	PNLS RD M5	3	1	J		42.00		2152.00	1.868	2.228	5.22	267.41	2.25	6.964	0.000	6.964	95	200	203	DWC	-117	520	0.010	0.60	18.73	0.37	0.93	0.43	OK	0.55	OK	0.08	0.00	-0.16	-0.160	-0.24	2.03	2.47	OK
608	PNLS RD M15	PNLS RD M14	0	1	H		30.00		30.00	2.974	2.398	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	52	52	0.010	1.88	59.25	0.00	0.30	0.07	OK	0.56	OK	0.58	0.00	1.87		1.29	1.10	1.11	OK
609	PNLS RD M14	PNLS RD M13	1	1	C		30.00		60.00	2.398	2.386	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	2500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.29		1.12	1.11	1.27	OK
610	PNLS RD M13	PNLS RD M12	1	1	C		30.00		90.00	2.386	2.350	3.73	11.18	2.25	0.291	0.000	0.291	20	200	203	DWC	833	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.12		0.95	1.27	1.40	OK
611	PNLS RD M12	PNLS RD M11	1	1	C		30.00		120.00	2.350	2.162	3.73	14.91	2.25	0.388	0.000	0.388	23	200	203	DWC	160	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.95		0.78	1.40	1.38	OK
612	PNLS RD M11	PNLS RD M10	1	1	C		30.00		150.00	2.162	2.131	3.73	18.64	2.25	0.485	0.000	0.485	25	200	203	DWC	968	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.78		0.69	1.38	1.44	OK
613	PNLS RD M10	PNLS RD M9	1	1	C		30.00		180.00	2.131	2.132	3.73	22.37	2.25	0.582	0.000	0.582	28	200	203	DWC	-30000	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.69		0.62	1.44	1.51	OK
614	PNLS RD M9	PNLS RD M8	1	1	C		30.00		210.00	2.132	2.028	3.73	26.10	2.25	0.680	0.000	0.680	30	200	203	DWC	288	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.62		0.56	1.51	1.47	OK
615	PNLS RD M8	PNLS RD M7	1	1	C		30.00		240.00	2.024	2.002	3.73	29.82	2.25	0.777	0.000	0.777	32	200	203	DWC	1364	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.56		0.50	1.46	1.50	OK
616	PNLS RD M7	PNLS RD M6	1	1	C		30.00		270.00	2.002	1.991	3.73	33.55	2.25	0.874	0.000	0.874	34	200	203	DWC	2727	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	0.50		0.44	1.50	1.55	OK
617	PNLS RD M6	PNLS RD M5	1	1	C		30.00		300.00	1.991	1.868	3.73	37.28	2.25	0.971	0.000	0.971	36	200	203	DWC	244	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	0.44		0.38	1.55	1.49	OK
618	PNLS RD M1	PNLS RD M2	0	1	H		30.00		30.00	2.282	2.074	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	144	144	0.010	1.13	35.60	0.00	0.30	0.07	OK	0.34	OK	0.21	0.00	1.18		0.97	1.10	1.10	OK
619	PNLS RD M2	PNLS RD M3	1	1	C		30.00		60.00	2.074	2.021	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	566	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.97		0.80	1.10	1.22	OK
620	PNLS RD M3	PNLS RD M4	1	1	C		30.00		90.00	2.021	1.964	3.73	11.18	2.25	0.291	0.000	0.291	20	200	203	DWC	526	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.80		0.63	1.22	1.33	OK
621	PNLS RD M4	PNLS RD M5	1	1	C		27.00		117.00	1.964	1.868	3.36	14.54	2.25	0.379	0.000	0.379	22	200	203	DWC	281	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.15	0.00	0.63		0.48	1.33	1.39	OK
622	PNLS RD M5	PNLS RD M5.1	3	1	J		26.00		2595.00	1.868	1.754	3.23	322.46	2.25	8.397	0.000	8.397	104	200	203	DWC	228	520	0.010	0.60	18.73	0.45	0.98	0.47	OK	0.58	OK	0.05	0.00	-0.24	-0.240	-0.29	2.11	2.04	OK
623	PNLS RD M5.1	PNLS RD M5.2	1	1	C		15.00		2610.00	1.754	1.808	1.86	324.32	2.25	8.446	0.000	8.446	104	200	203	DWC	-278	520	0.010	0.60	18.73	0.45	0.98	0.47	OK	0.58	OK								

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW1+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)/m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole	
664	9CR RD M8.1	9CR RD M8.2	0	1	H		20.00		20.00	1.992	1.970	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	909	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.89		0.78	1.10	1.19	OK
665	9CR RD M8.2	9CR RD M8.3	1	1	C		30.00		50.00	1.970	1.921	3.73	6.21	2.25	0.162	0.000	0.162	15	200	203	DWC	612	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.78		0.61	1.19	1.31	OK
666	9CR RD M8.3	9CR RD M8.4	2	1	J		20.00		253.00	1.920	1.871	2.49	31.44	2.25	0.819	0.000	0.819	33	200	203	DWC	408	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	0.37	0.370	0.33	1.55	1.54	OK
667	9CR RD M8.4	9CR RD M9.3	1	1	C		18.00		271.00	1.871	1.994	2.24	33.68	2.25	0.877	0.000	0.877	34	200	203	DWC	-146	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.03	0.00	0.33		0.30	1.54	1.69	OK
668	9CR RD M9.3	EF RD M20	1	1	C		35.00		306.00	1.994	1.895	4.35	38.02	2.25	0.990	0.000	0.990	36	200	203	DWC	354	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.07	0.00	0.30		0.23	1.69	1.67	OK
669	EF RD M20	EF RD M21	2	1	J		18.00		773.00	1.895	1.951	2.24	96.05	2.25	2.501	0.000	2.501	57	200	203	DWC	-321	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.03	0.00	0.08	0.080	0.05	1.82	1.90	OK
670	EF RD M21	EF RD M22	1	1	C		20.00		793.00	1.951	2.003	2.49	98.54	2.25	2.566	0.000	2.566	58	200	203	DWC	-385	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.04	0.00	0.05		0.01	1.90	1.99	OK
671	EF RD M22	EF-PNLS RD M23	1	1	C		30.00		823.00	2.003	1.931	3.73	102.27	2.25	2.663	0.000	2.663	59	200	203	DWC	417	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.06	0.00	0.01		-0.05	1.99	1.98	OK
672	9ST RD M3	9ST RD M4	0	1	H		20.00		20.00	2.102	2.168	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	-303	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.00		0.89	1.10	1.28	OK
673	9ST RD M4	EF-9ST RD M27	1	1	C		30.00		50.00	2.168	2.256	3.73	6.21	2.25	0.162	0.000	0.162	15	200	203	DWC	-341	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.89		0.72	1.28	1.54	OK
674	EF-9ST RD M27	EF-8ST RD M26	1	1	C		13.00		63.00	2.256	2.156	1.62	7.83	2.25	0.204	0.000	0.204	17	200	203	DWC	130	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	0.72		0.65	1.54	1.51	OK
675	8ST RD M3	8ST RD M4	0	1	H		30.00		30.00	1.994	2.019	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	-1200	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.89		0.72	1.10	1.30	OK
676	8ST RD M4	EF-8ST RD M26	1	1	C		14.00		44.00	2.019	2.156	1.74	5.47	2.25	0.142	0.000	0.142	14	200	203	DWC	-102	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.72		0.64	1.30	1.52	OK
677	EF-8ST RD M26	EF-SBT RD M25	2	1	J		18.00		125.00	2.156	2.150	2.24	15.53	2.25	0.404	0.000	0.404	23	200	203	DWC	3000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	0.64	0.640	0.54	1.52	1.61	OK
678	SBT RD M2.2	SBT RD M2.3	0	1	H		16.00		16.00	1.883	2.077	1.99	1.99	2.25	0.052	0.000	0.052	9	200	203	DWC	-82	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	0.78		0.69	1.10	1.39	OK
679	SBT RD M2.3	SBT RD M2.4	1	1	C		28.00		44.00	2.077	2.113	3.48	5.47	2.25	0.142	0.000	0.142	14	200	203	DWC	-778	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	0.69		0.53	1.39	1.58	OK
680	SBT RD M2.4	EF-SBT RD M25	1	1	C		30.00		74.00	2.113	2.150	3.73	9.20	2.25	0.239	0.000	0.239	18	200	203	DWC	-811	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.53		0.36	1.58	1.79	OK
681	EF-SBT RD M25	EF RD M24	2	1	J		20.00		219.00	2.003	2.003	2.49	27.21	2.25	0.709	0.000	0.709	31	200	203	DWC	136	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	0.36	0.360	0.32	1.79	1.68	OK
682	EF RD M24	EF-PNLS RD M23	1	1	C		20.00		239.00	2.003	1.961	2.49	29.70	2.25	0.773	0.000	0.773	32	200	203	DWC	476	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	0.32		0.28	1.68	1.68	OK
683	EF-PNLS RD M23	PNLS RD M5.8	2	1	J		30.00		1092.00	1.961	1.981	3.73	135.69	2.25	3.534	0.000	3.534	68	200	203	DWC	-1500	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.06	0.00	-0.05	-0.050	-0.11	2.01	2.09	OK
684	PNLS RD M5.8	PNLS RD M5.7	1	1	C		20.00		1112.00	1.981	2.035	2.49	138.18	2.25	3.598	0.000	3.598	68	200	203	DWC	-370	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.04	0.00	-0.11		-0.15	2.09	2.19	OK
685	PNLS RD M5.7	PNLS RD M5.6	1	1	C		30.00		1142.00	2.035	2.706	3.73	141.91	2.25	3.696	0.000	3.696	69	200	203	DWC	-45	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.06	0.00	-0.15		-0.21	2.19	2.92	OK
686	PNLS RD M5.6	PNLS-9CR RD M5.5	1	1	C		30.00		1172.00	2.706	1.840	3.73	145.64	2.25	3.793	0.000	3.793	70	200	203	DWC	35	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.06	0.00	-0.21		-0.27	2.92	2.11	OK
687	9CR RD M6.2	9CR RD M6.3	0	1	H		20.00		20.00	2.044	2.020	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	833	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.94		0.83	1.10	1.19	OK
688	9CR RD M6.3	PNLS-9CR RD M5.5	1	1	C		18.00		38.00	2.020	1.840	2.24	4.72	2.25	0.123	0.000	0.123	13	200	203	DWC	100	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	0.83		0.73	1.19	1.11	OK
689	PNLS-9CR RD M5.5	PNLS-SBT RD M5.6	2	1	J		25.00		1235.00	1.840	1.840	3.11	153.46	2.25	3.996	0.000	3.996	72	200	203	DWC	0	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.05	0.00	-0.27	-0.270	-0.32	2.11	2.16	OK
690	PNLS-SBT RD M5.6	SBT-6ST RD M1	2	1	J		16.00		4146.00	1.840	1.854	1.99	515.19	2.25	13.416	0.000	13.416	131	200	203	DWC	-1143	520	0.010	0.60	18.73	0.72	1.09	0.63	OK	0.65	OK	0.03	0.00	-0.47	-0.470	-0.50	2.31	2.35	OK
691	6ST RD M1	SBT-6ST RD M1	0	1	H		31.00		31.00	1.840	1.854	3.85	3.85	2.25	0.100	0.000	0.100	12	200	203	DWC	-73	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.33		0.16	1.10	1.69	OK
692	SBT-6ST RD M1	SBT RD M2	2	1	J		15.00		4192.00	1.854	1.883	1.86	520.91	2.25	13.565	0.000	13.565	132	200	203	DWC	-517	520	0.010	0.60	18.73	0.72	1.09	0.63	OK	0.65	OK	0.03	0.00	-0.50	-0.500	-0.53	2.35	2.41	OK
693	SBT RD M2	SBT-8ST RD M3	1	1	C		22.00		4214.00	1.883	1.898	2.73	523.64	2.25	13.636	0.000	13.636	132	200	203	DWC	-1467	520	0.010	0.60	18.73	0.73	1.09	0.64	OK	0.65	OK	0.04	0.00	-0.53		-0.57	2.41	2.47	OK
694	SBT RD M19	SBT RD M18	0	1	H		29.00		29.00	2.354	2.244	3.60	3.60	2.25	0.094	0.000	0.094	11	200	203	DWC	264	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	1.25		1.09	1.10	1.15	OK
695	SBT RD M18	SBT RD M18.1	1	1	C		30.00		59.00	2.244	2.177	3.73	7.33	2.25	0.191	0.000	0.191	16	200	203	DWC	448	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.09		0.92	1.15	1.26	OK
696	SBT RD M18.1	SBT RD M18.2	1	1	C		28.00		87.00	2.177	2.198	3.48	10.81	2.25	0.282	0.000	0.282	19	200	203	DWC	-1333	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	0.92		0.76	1.26	1.44	OK
697	SBT RD M18.2	SBT RD M18.3	1	1	C		34.00		121.00	2.194	2.127	4.22	15.04	2.25	0.392	0.000	0.392																							

Sl. No.	Man Holes				Ma nho le Typ e	MANH OLE TYPE	Length in m	CUMULATI VE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW1+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s			From		To	Starting Manhole	Ending manhole		
734	SBT RD M9	SBT RD M10	2	1	J		19.00		5079.00	1.950	1.920	2.36	631.13	2.25	16.436	0.000	16.436	145	250	253	DWC	633	700	0.010	0.60	29.28	0.56	1.03	0.54	OK	0.61	OK	0.03	0.00	-0.72	-0.720	-0.75	2.67	2.67	OK
735	P10BC RD M1	P10BC RD M2	0	1	H		30.00		30.00	2.204	2.153	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	588	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.10		0.93	1.10	1.22	OK
736	P10BC RD M2	P10BC RD M3	1	1	C		30.00		60.00	2.153	2.103	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	600	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.93		0.76	1.22	1.34	OK
737	P10BC RD M3	P10BC RD M4	1	1	C		30.00		90.00	2.103	2.110	3.73	11.18	2.25	0.291	0.000	0.291	20	200	203	DWC	-4286	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.76		0.59	1.34	1.52	OK
738	P10BC RD M4	P10BC RD M5	1	1	C		30.00		120.00	2.110	2.055	3.73	14.91	2.25	0.388	0.000	0.388	23	200	203	DWC	545	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.59		0.42	1.52	1.64	OK
739	P10BC RD M6	P10BC RD M5	0	1	H		30.00		30.00	1.993	2.055	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	-484	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.89		0.72	1.10	1.34	OK
740	P10BC RD M5	SBT RD M15A	2	1	J		20.00		170.00	2.055	2.092	2.49	21.12	2.25	0.550	0.000	0.550	27	200	203	DWC	-541	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	0.42	0.420	0.36	1.64	1.73	OK
741	SBT RD M15A	SBT RD M15	1	1	C		30.00		200.00	2.092	1.995	3.73	24.85	2.25	0.647	0.000	0.647	29	200	203	DWC	309	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.36		0.29	1.73	1.71	OK
742	SBT RD M17	SBT RD M16	0	1	H		30.00		30.00	2.104	2.019	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	353	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.00		0.83	1.10	1.19	OK
743	SBT RD M16	SBT RD M15	1	1	C		19.00		49.00	2.019	1.995	2.36	6.09	2.25	0.159	0.000	0.159	15	200	203	DWC	792	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.83		0.72	1.19	1.28	OK
744	SBT RD M15	SBT RD M14	2	1	J		27.00		276.00	1.995	2.094	3.36	34.30	2.25	0.893	0.000	0.893	34	200	203	DWC	-273	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	0.29	0.290	0.24	1.71	1.85	OK
745	SBT RD M14	SBT RD M13	1	1	C		30.00		306.00	2.094	2.199	3.73	38.02	2.25	0.990	0.000	0.990	36	200	203	DWC	-286	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	0.24		0.18	1.85	2.02	OK
746	SBT RD M13.2	SBT RD M13.1	0	1	H		30.00		30.00	2.234	2.218	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	1875	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.13		0.96	1.10	1.26	OK
747	SBT RD M13.1	SBT RD M13	1	1	C		17.00		47.00	2.218	2.199	2.11	5.84	2.25	0.152	0.000	0.152	14	200	203	DWC	895	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	0.96		0.87	1.26	1.33	OK
748	SBT RD M13	SBT RD M12	2	1	J		23.00		376.00	2.199	2.132	2.86	46.72	2.25	1.217	0.000	1.217	40	200	203	DWC	343	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	0.18	0.180	0.14	2.02	1.99	OK
749	SBT RD M12	SBT RD M11	1	1	C		30.00		406.00	2.132	2.065	3.73	50.45	2.25	1.314	0.000	1.314	41	200	203	DWC	448	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	0.14		0.08	1.99	1.99	OK
750	SBT RD M11	SBT RD M10	1	1	C		18.00		424.00	2.065	1.920	2.24	52.69	2.25	1.372	0.000	1.372	42	200	203	DWC	124	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.03	0.00	0.08		0.05	1.99	1.87	OK
751	SBT RD M10	PN8CR RD M1	2	1	J		13.00		5516.00	1.920	1.928	1.62	685.43	2.25	17.850	0.000	17.850	151	250	253	DWC	-1625	700	0.010	0.60	29.28	0.61	1.05	0.57	OK	0.63	OK	0.02	0.00	-0.75	-0.750	-0.77	2.67	2.70	OK
752	PN8CR RD M1	PN8CR RD M2	1	1	C		20.00		5536.00	1.928	1.862	2.49	687.92	2.25	17.914	0.000	17.914	152	250	253	DWC	303	700	0.010	0.60	29.28	0.61	1.05	0.57	OK	0.63	OK	0.03	0.00	-0.77		-0.80	2.70	2.66	OK
753	PN8CR RD M2	PN8CR RD M3	1	1	C		30.00		5566.00	1.862	1.969	3.73	691.64	2.25	18.012	0.000	18.012	152	250	253	DWC	-280	700	0.010	0.60	29.28	0.62	1.05	0.57	OK	0.63	OK	0.04	0.00	-0.80		-0.84	2.66	2.81	OK
754	PN8CR RD M3	PN8CR RD M4	1	1	C		30.00		5596.00	1.969	2.071	3.73	695.37	2.25	18.109	0.000	18.109	152	250	253	DWC	-294	700	0.010	0.60	29.28	0.62	1.05	0.57	OK	0.63	OK	0.04	0.00	-0.84		-0.88	2.81	2.95	OK
755	PN8CR RD M4	PN8CR RD M5	1	1	C		30.00		5626.00	2.071	2.624	3.73	699.10	2.25	18.206	0.000	18.206	153	250	253	DWC	-54	700	0.010	0.60	29.28	0.62	1.05	0.57	OK	0.63	OK	0.04	0.00	-0.88		-0.92	2.95	3.54	OK
756	PN8CR RD M5	CRG RD M13.2	1	1	C		41.00		5667.00	2.624	1.174	5.09	704.19	2.25	18.338	0.000	18.338	153	250	253	DWC	28	700	0.010	0.60	29.28	0.63	1.05	0.58	OK	0.63	OK	0.06	0.00	-0.92		-0.98	3.54	2.15	OK
757	CRG RD M13.2	CRG RD M13.3	1	1	C		30.00		5697.00	1.174	1.943	3.73	707.92	2.25	18.435	0.000	18.435	154	250	253	DWC	-39	700	0.010	0.60	29.28	0.63	1.05	0.58	OK	0.63	OK	0.04	0.00	-0.98		-1.02	2.15	2.96	OK
758	CRG RD M13.3	CRG RD M13.4	1	1	C		30.00		5727.00	1.943	2.019	3.73	711.65	2.25	18.533	0.000	18.533	154	250	253	DWC	-395	700	0.010	0.60	29.28	0.63	1.05	0.58	OK	0.63	OK	0.04	0.00	-1.02		-1.06	2.96	3.08	OK
759	CRG RD M13.4	CRG RD M13.5	1	1	C		31.00		5758.00	2.019	2.127	3.85	715.50	2.25	18.633	0.000	18.633	155	250	253	DWC	-287	700	0.010	0.60	29.28	0.64	1.06	0.59	OK	0.63	OK	0.04	0.00	-1.06		-1.10	3.08	3.23	OK
760	CRG RD M15.5	CRG RD M15.6	0	1	H		23.00		23.00	2.243	2.410	2.86	2.86	2.25	0.074	0.000	0.074	10	200	203	DWC	-138	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	1.14		1.01	1.10	1.40	OK
761	CRG RD M15.6	CRG RD M13.5	1	1	C		10.00		33.00	2.410	2.127	1.24	4.10	2.25	0.107	0.000	0.107	12	200	203	DWC	35	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	1.01		0.95	1.40	1.18	OK
762	CRG RD M13.5	CRG RD M13.6	2	1	J		30.00		5821.00	2.127	2.086	3.73	723.33	2.25	18.837	0.000	18.837	155	250	253	DWC	732	700	0.010	0.60	29.28	0.64	1.06	0.59	OK	0.63	OK	0.04	0.00	-1.10	-1.100	-1.14	3.23	3.23	OK
763	CRG RD M13.6	CRG RD M13.7	1	1	C		30.00		5851.00	2.086	2.071	3.73	727.06	2.25	18.934	0.000	18.934	156	250	253	DWC	2000	700	0.010	0.60	29.28	0.65	1.06	0.59	OK	0.63	OK	0.04	0.00	-1.14		-1.18	3.23	3.25	OK
764	CRG RD M13.7	CRG RD M13.8	1	1	C		30.00		5881.00	2.071	2.041	3.73	730.79	2.25	19.031	0.000	19.031	156	250	253	DWC	1000	700	0.010	0.60	29.28	0.65	1.06	0.59	OK	0.63	OK	0.04	0.00	-1.18		-1.22	3.25	3.26	OK
765	CRG RD M13.8	CRG RD M13	1	1	C		31.00		5912.00	2.041	2.026	3.85	734.64	2.25	19.131	0.000	19.131	157	250	253	DWC	2067	700	0.010	0.60	29.28	0.65	1.06	0.59	OK	0.63	OK	0.04	0.00	-1.22		-1.26	3.26	3.29	OK
766	CRG RD M13	CRG RD M12	2	1	J		20.00		19681.00	2.026	2.130	2.49	2445.61	2.25	63.688	0.000	63.688	285	384	450	HDP	-192	1000	0.010	0.66	76.93	0.83	1.12	0.70	OK	0.74	OK	0.02	0.00	-2.00	-2.000	-2.02	4.03	4.15	OK
767	CRG RD M12																																							

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in 1	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW1+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)/m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole	
808	GNC RD M20	GNC RD M19	1	1	C		30.00		20774.00	2.410	2.341	3.73	2581.42	2.25	67.225	0.000	67.225	293	384	450	HDPE	435	1000	0.010	0.66	76.93	0.87	1.12	0.72	OK	0.74	OK	0.03	0.00	-2.44		-2.47	4.85	4.81	OK
809	GNC RD M19	GNC RD M18	1	1	C		30.00		20804.00	2.341	2.309	3.73	2585.15	2.25	67.322	0.000	67.322	293	384	450	HDPE	937	1000	0.010	0.66	76.93	0.88	1.13	0.73	OK	0.75	OK	0.03	0.00	-2.47		-2.50	4.81	4.81	OK
810	GNC RD M18	GNC RD M17	1	1	C		30.00		20834.00	2.309	2.358	3.73	2588.88	2.25	67.419	0.000	67.419	294	384	450	HDPE	-612	1000	0.010	0.66	76.93	0.88	1.13	0.73	OK	0.75	OK	0.03	0.00	-2.50		-2.53	4.81	4.89	OK
811	GNC RD M17	GNC RD M16	1	1	C		30.00		20864.00	2.360	2.320	3.73	2592.61	2.25	67.516	0.000	67.516	294	384	450	HDPE	750	1000	0.010	0.66	76.93	0.88	1.13	0.73	OK	0.75	OK	0.03	0.00	-2.53		-2.56	4.89	4.88	OK
812	GNC RD M16	GNC-8CR RD M1	1	1	C		22.00		20886.00	2.320	2.282	2.73	2595.34	2.25	67.587	0.000	67.587	294	384	450	HDPE	579	1000	0.010	0.66	76.93	0.88	1.13	0.73	OK	0.75	OK	0.02	0.00	-2.56		-2.58	4.88	4.86	OK
813	4CR RD M10	4CR RD M9	0	1	H		26.00		26.00	2.502	2.330	3.23	3.23	2.25	0.084	0.000	0.084	11	200	203	DWC	151	151	0.010	1.10	34.77	0.00	0.30	0.07	OK	0.33	OK	0.17	0.00	1.40		1.23	1.10	1.10	OK
814	4CR RD M9	4CR-TH RD M8	1	1	C		30.00		56.00	2.330	2.157	3.73	6.96	2.25	0.181	0.000	0.181	16	200	203	DWC	173	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	1.23		1.05	1.10	1.11	OK
815	TH RD M1.1	TH RD M1	0	1	H		15.00		15.00	2.554	2.578	1.86	1.86	2.25	0.049	0.000	0.049	8	200	203	DWC	-625	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	1.45		1.37	1.10	1.21	OK
816	TH RD M1	TH RD M2	1	1	C		23.00		38.00	2.578	2.597	2.86	4.72	2.25	0.123	0.000	0.123	13	200	203	DWC	-1211	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	1.37		1.24	1.21	1.36	OK
817	TH RD M2	TH RD M3	1	1	C		30.00		68.00	2.597	2.495	3.73	8.45	2.25	0.220	0.000	0.220	17	200	203	DWC	294	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.24		1.07	1.36	1.43	OK
818	TH RD M3	TH RD M4	1	1	C		30.00		98.00	2.495	2.394	3.73	12.18	2.25	0.317	0.000	0.317	21	200	203	DWC	297	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.07		0.90	1.43	1.49	OK
819	TH RD M4	TH RD M5	1	1	C		20.00		118.00	2.394	2.347	2.49	14.66	2.25	0.382	0.000	0.382	23	200	203	DWC	426	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.90		0.79	1.49	1.56	OK
820	TH RD M5	TH RD M6	1	1	C		17.00		135.00	2.347	2.300	2.11	16.78	2.25	0.437	0.000	0.437	24	200	203	DWC	362	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	0.79		0.70	1.56	1.60	OK
821	TH RD M6	TH RD M7	1	1	C		30.00		165.00	2.300	2.181	3.73	20.50	2.25	0.534	0.000	0.534	27	200	203	DWC	252	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.70		0.61	1.60	1.57	OK
822	TH RD M7	TH RD M8	1	1	C		30.00		195.00	2.181	2.094	3.73	24.23	2.25	0.631	0.000	0.631	29	200	203	DWC	345	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.61		0.54	1.57	1.55	OK
823	TH RD M8	4CR-TH RD M8	1	1	C		27.00		222.00	2.094	2.157	3.36	27.59	2.25	0.718	0.000	0.718	31	200	203	DWC	-429	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	0.54		0.49	1.55	1.67	OK
824	TH-6CR RD M12	TH RD M11	0	1	H		20.00		20.00	2.344	2.270	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	270	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.24		1.13	1.10	1.14	OK
825	TH RD M11	TH RD M10	1	1	C		16.00		36.00	2.270	2.198	1.99	4.47	2.25	0.116	0.000	0.116	13	200	203	DWC	222	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	1.13		1.04	1.14	1.16	OK
826	TH RD M10	TH RD M9	1	1	C		20.00		56.00	2.198	2.172	2.49	6.96	2.25	0.181	0.000	0.181	16	200	203	DWC	769	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.04		0.93	1.16	1.24	OK
827	TH RD M9	4CR-TH RD M8	1	1	C		36.00		92.00	2.172	2.157	4.47	11.43	2.25	0.298	0.000	0.298	20	200	203	DWC	2400	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.20	0.00	0.93		0.73	1.24	1.43	OK
828	4CR-TH RD M8	4CR RD M7	3	1	J		20.00		390.00	2.157	2.284	2.49	48.46	2.25	1.262	0.000	1.262	41	200	203	DWC	-157	180	0.010	1.01	31.84	0.04	0.51	0.15	OK	0.52	OK	0.11	0.00	0.49	0.490	0.38	1.67	1.90	OK
829	4CR RD M7	4CR-SBA RD M6	1	1	C		20.00		410.00	2.284	2.286	2.49	50.95	2.25	1.327	0.000	1.327	42	200	203	DWC	-10000	180	0.010	1.01	31.84	0.04	0.51	0.15	OK	0.52	OK	0.11	0.00	0.38		0.27	1.90	2.02	OK
830	2CR-KST RD M1	2CRA RD M2	0	1	H		34.00		34.00	2.574	2.388	4.22	4.22	2.25	0.110	0.000	0.110	12	200	203	DWC	183	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.19	0.00	1.47		1.28	1.10	1.11	OK
831	2CRA RD M2	2CRA RD M3	1	1	C		25.00		59.00	2.388	2.403	3.11	7.33	2.25	0.191	0.000	0.191	16	200	203	DWC	-1667	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	1.28		1.14	1.11	1.26	OK
832	2CRA RD M3	SBA-2CR RD M5	1	1	C		30.00		89.00	2.403	2.418	3.73	11.06	2.25	0.288	0.000	0.288	20	200	203	DWC	-2000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.14		0.97	1.26	1.45	OK
833	SBA RD M1	SBA RD M2	0	1	H		30.00		30.00	2.224	2.368	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	-208	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.12		0.95	1.10	1.42	OK
834	SBA RD M2	SBA RD M3	1	1	C		30.00		60.00	2.368	2.326	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	714	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.95		0.78	1.42	1.55	OK
835	SBA RD M3.2	SBA RD M3.1	0	1	H		17.00		17.00	2.364	2.347	2.11	2.11	2.25	0.055	0.000	0.055	9	200	203	DWC	1000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	1.26		1.17	1.10	1.18	OK
836	SBA RD M3.1	SBA RD M3	1	1	C		20.00		37.00	2.347	2.326	2.49	4.60	2.25	0.120	0.000	0.120	13	200	203	DWC	952	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.17		1.06	1.18	1.27	OK
837	SBA RD M3	SBA RD M4	2	1	J		15.00		112.00	2.326	2.372	1.86	13.92	2.25	0.362	0.000	0.362	22	200	203	DWC	-326	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	0.78	0.780	0.59	1.55	1.67	OK
838	SBA RD M4	SBA-2CR RD M5	1	1	C		20.00		132.00	2.372	2.414	2.49	16.40	2.25	0.427	0.000	0.427	24	200	203	DWC	-476	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.70		0.59	1.67	1.82	OK
839	SBA-2CR RD M5	SBA RD M6	2	1	J		30.00		251.00	2.414	2.416	3.73	31.19	2.25	0.812	0.000	0.812	33	200	203	DWC	-15000	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.59	0.590	0.53	1.82	1.89	OK
840	SBA RD M6	SBA RD M7	1	1	C		11.00		262.00	2.416	2.420	1.37	32.56	2.25	0.848	0.000	0.848	33	200	203	DWC	-2750	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.02	0.00	0.53		0.51	1.89	1.91	OK
841	SBA RD M7	SBA RD M8	1	1	C		25.00		287.00	2.420	2.167	3.11	35.66	2.25	0.929	0.000	0.929	35	200	203	DWC	99	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05							

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in 1	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW1+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)/m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole	
882	KST RD M4	4CR-KST RD M1	1	1	C		20.00		100.00	2.063	2.291	2.49	12.43	2.25	0.324	0.000	0.324	21	200	203	DWC	-88	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.61	0.120	0.50	1.45	1.79	OK
883	4CR-KST RD M1	PNA RD M5	3	1	J		23.00		1755.00	2.291	2.391	2.86	218.08	2.25	5.679	0.000	5.679	86	200	203	DWC	-230	520	0.010	0.60	18.73	0.30	0.88	0.38	OK	0.52	OK	0.04	0.00	0.12	0.120	0.08	2.17	2.31	OK
884	PNA RD M1	PNA RD M2	0	1	H		30.00		30.00	2.564	2.565	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	-30000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.46		1.29	1.10	1.28	OK
885	PNA RD M2	PNA RD M3	1	1	C		30.00		60.00	2.565	2.552	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	2308	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.29		1.12	1.28	1.43	OK
886	PNA RD M3	PNA RD M4	1	1	C		30.00		90.00	2.552	2.523	3.73	11.18	2.25	0.291	0.000	0.291	20	200	203	DWC	1034	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.12		0.95	1.43	1.57	OK
887	PNA RD M4	PNA RD M5	1	1	C		42.00		132.00	2.523	2.391	5.22	16.40	2.25	0.427	0.000	0.427	24	200	203	DWC	318	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.23	0.00	0.95		0.72	1.57	1.67	OK
888	PNA RD M5	PNA RD M6	2	1	J		18.00		1905.00	2.391	2.268	2.24	236.72	2.25	6.165	0.000	6.165	89	200	203	DWC	146	520	0.010	0.60	18.73	0.33	0.90	0.40	OK	0.54	OK	0.03	0.00	0.08	0.080	0.05	2.31	2.22	OK
889	PNA RD M6	PNA RD M7	1	1	C		20.00		1925.00	2.268	2.289	2.49	239.20	2.25	6.229	0.000	6.229	90	200	203	DWC	-952	520	0.010	0.60	18.73	0.33	0.90	0.40	OK	0.54	OK	0.04	0.00	0.05		0.01	2.22	2.28	OK
890	PNA RD M7	PNA-3CR RD M8	1	1	C		17.00		1942.00	2.289	2.312	2.11	241.32	2.25	6.284	0.000	6.284	90	200	203	DWC	-739	520	0.010	0.60	18.73	0.34	0.91	0.41	OK	0.54	OK	0.03	0.00	0.01		-0.02	2.28	2.33	OK
891	PNA RD M16	PNA RD M15	0	1	H		30.00		30.00	2.404	2.498	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	-319	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.30		1.13	1.10	1.37	OK
892	PNA RD M15	PNA RD M14	1	1	C		19.00		49.00	2.498	2.450	2.36	6.09	2.25	0.159	0.000	0.159	15	200	203	DWC	396	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.13		1.02	1.37	1.43	OK
893	PNA RD M14	PNA RD M13	1	1	C		30.00		79.00	2.450	2.320	3.73	9.82	2.25	0.256	0.000	0.256	19	200	203	DWC	231	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.02		0.85	1.43	1.47	OK
894	PNA RD M13	PNA RD M12	1	1	C		17.00		96.00	2.320	2.544	2.11	11.93	2.25	0.311	0.000	0.311	20	200	203	DWC	-76	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	0.85		0.76	1.47	1.78	OK
895	PNA RD M12	PNA RD M11	1	1	C		20.00		116.00	2.544	2.568	2.49	14.41	2.25	0.375	0.000	0.375	22	200	203	DWC	-833	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.76		0.65	1.78	1.92	OK
896	PNA RD M11	PNA RD M10	1	1	C		30.00		146.00	2.568	2.589	3.73	18.14	2.25	0.472	0.000	0.472	25	200	203	DWC	-1429	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.65		0.48	1.92	2.11	OK
897	PNA RD M10	PNA RD M9	1	1	C		20.00		166.00	2.589	2.470	2.49	20.63	2.25	0.537	0.000	0.537	27	200	203	DWC	168	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	0.48		0.42	2.11	2.05	OK
898	PNA RD M9	PNA-3CR RD M8	1	1	C		26.00		192.00	2.470	2.312	3.23	23.86	2.25	0.621	0.000	0.621	29	200	203	DWC	165	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	0.42		0.36	2.05	1.95	OK
899	PNA-3CR RD M8	3CR RD M1	2	1	J		17.00		2151.00	2.312	2.283	2.11	267.29	2.25	6.961	0.000	6.961	95	200	203	DWC	586	520	0.010	0.60	18.73	0.37	0.93	0.43	OK	0.55	OK	0.03	0.00	-0.02	0.020	-0.05	2.33	2.33	OK
900	3CR RD M1	3CR RD M2	1	1	C		15.00		2166.00	2.283	2.163	1.86	269.15	2.25	7.009	0.000	7.009	95	200	203	DWC	125	520	0.010	0.60	18.73	0.37	0.93	0.43	OK	0.55	OK	0.03	0.00	-0.05		-0.08	2.33	2.24	OK
901	3CR RD M2	3CR RD M3	1	1	C		30.00		2196.00	2.163	2.196	3.73	272.88	2.25	7.106	0.000	7.106	96	200	203	DWC	-909	520	0.010	0.60	18.73	0.38	0.93	0.43	OK	0.55	OK	0.06	0.00	-0.08		-0.14	2.24	2.34	OK
902	P7CR RD M1	P7CR RD M2	0	1	H		20.00		20.00	2.553	2.475	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	256	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.45		1.34	1.10	1.14	OK
903	P7CR RD M2	P7CR RD M3	1	1	C		24.00		44.00	2.475	2.284	2.98	5.47	2.25	0.142	0.000	0.142	14	200	203	DWC	126	126	0.010	1.21	38.06	0.00	0.30	0.07	OK	0.36	OK	0.19	0.00	1.34		1.15	1.14	1.13	OK
904	P7CR RD M3	P7CR RD M3A	1	1	C		20.00		64.00	2.284	2.284	2.49	7.95	2.25	0.207	0.000	0.207	17	200	203	DWC	0	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.15		1.04	1.13	1.24	OK
905	P7CR RD M3A	P5CR RD M3	1	1	C		28.00		92.00	2.284	2.247	3.48	11.43	2.25	0.298	0.000	0.298	20	200	203	DWC	757	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	1.04		0.88	1.24	1.37	OK
906	P5CR RD M1	P5CR RD M2	0	1	H		20.00		20.00	2.314	2.314	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	0	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.21		1.10	1.10	1.21	OK
907	P5CR RD M2	P5CR RD M3	1	1	C		27.00		47.00	2.314	2.247	3.36	5.84	2.25	0.152	0.000	0.152	14	200	203	DWC	403	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	1.10		0.95	1.21	1.30	OK
908	P5CR RD M3	3CR RD M3.4	2	1	J		30.00		169.00	2.244	2.154	3.73	21.00	2.25	0.547	0.000	0.547	27	200	203	DWC	333	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.88	0.880	0.79	1.36	1.36	OK
909	3CR RD M3.4	3CR RD M3.3	1	1	C		20.00		189.00	2.154	2.170	2.49	23.49	2.25	0.612	0.000	0.612	28	200	203	DWC	-1250	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	0.79		0.74	1.36	1.43	OK
910	3CR RD M3.3	3CR RD M3.2	1	1	C		16.00		205.00	2.170	2.186	1.99	25.47	2.25	0.663	0.000	0.663	30	200	203	DWC	-1000	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.03	0.00	0.74		0.71	1.43	1.48	OK
911	PNA RD M10.1	PNA RD M10.2	0	1	H		20.00		20.00	2.484	2.274	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	95	95	0.010	1.39	43.83	0.00	0.30	0.07	OK	0.42	OK	0.21	0.00	1.38		1.17	1.10	1.10	OK
912	PNA RD M10.3	PNA RD M10.2	0	1	H		35.00		35.00	2.294	2.274	4.35	4.35	2.25	0.113	0.000	0.113	13	200	203	DWC	1750	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.19	0.00	1.19		1.00	1.10	1.27	OK
913	PNA RD M10.2	3CR RD M3.2	2	1	J		29.00		84.00	2.274	2.186	3.60	10.44	2.25	0.272	0.000	0.272	19	200	203	DWC	330	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	1.00	1.000	0.84	1.27	1.35	OK
914	3CR RD M3.2	3CR RD M3.1	2	1	J		25.00		314.00	2.186	2.196	3.11	39.02	2.25	1.016	0.000	1.016	36	200	203	DWC	-2500	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	0.71	0.710	0.66	1.48	1.54	OK
915	3CR RD M3.1	3CR RD M3	1	1	C		25.00		339.00	2.196	2.196	3.11	42.12	2.25	1.097	0.000	1.097	38	200	203	DWC	0	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK</								

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.6m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW1+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)/m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole		
956	1CRA RD M8.5	1CRA RD M8.4	1	1	C		20.00		72.00	2.249	2.251	2.49	8.95	2.25	0.233	0.000	0.233	18	200	203	DWC	-10000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.07			0.96	1.18	1.29	OK
957	1CRA RD M8.4	1CRA RD M8.3	1	1	C		22.00		94.00	2.251	2.254	2.73	11.68	2.25	0.304	0.000	0.304	20	200	203	DWC	-7333	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	0.96			0.84	1.29	1.41	OK
958	1CRA RD M8.3	1CRA RD M8.2	1	1	C		22.00		116.00	2.254	2.125	2.73	14.41	2.25	0.375	0.000	0.375	22	200	203	DWC	171	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	0.84			0.72	1.41	1.41	OK
959	1CRA RD M8.2	1CRA RD M8.1	1	1	C		20.00		136.00	2.125	2.174	2.49	16.90	2.25	0.440	0.000	0.440	24	200	203	DWC	-408	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.72			0.61	1.41	1.56	OK
960	1CRA RD M8.1	1CRA RD M8	1	1	C		27.00		163.00	2.174	2.105	3.36	20.25	2.25	0.527	0.000	0.527	26	200	203	DWC	391	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	0.61			0.53	1.56	1.58	OK
961	1CRA RD M8	1CRA RD M7	2	1	J		20.00		279.00	2.105	2.140	2.49	34.67	2.25	0.903	0.000	0.903	34	200	203	DWC	-571	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	0.53	0.530		0.49	1.58	1.65	OK
962	1CRA RD M7	1CRA RD M6	1	1	C		20.00		299.00	2.140	2.222	2.49	37.15	2.25	0.968	0.000	0.968	36	200	203	DWC	-244	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	0.49			0.45	1.65	1.77	OK
963	1CRA RD M6	1CRA RD M5	1	1	C		20.00		319.00	2.222	2.213	2.49	39.64	2.25	1.032	0.000	1.032	37	200	203	DWC	2222	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	0.45			0.41	1.77	1.80	OK
964	1CRA RD M5	1CRA RD M4A	1	1	C		25.00		344.00	2.213	2.205	3.11	42.75	2.25	1.113	0.000	1.113	38	200	203	DWC	3125	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.05	0.00	0.41			0.36	1.80	1.85	OK
965	1CRA RD M4A	1CRA RD M4	1	1	C		25.00		369.00	2.205	2.327	3.11	45.85	2.25	1.194	0.000	1.194	40	200	203	DWC	-205	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.05	0.00	0.36			0.31	1.85	2.02	OK
966	1CRA RD M4	1CRA RD M4.1	2	1	J		20.00		602.00	2.327	2.319	2.49	74.81	2.25	1.948	0.000	1.948	50	200	203	DWC	2500	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.04	0.00	0.31	0.310		0.27	2.02	2.05	OK
967	1CRA RD M4.1	1CRA RD M4.2	1	1	C		28.00		630.00	2.319	2.311	3.48	78.29	2.25	2.039	0.000	2.039	51	200	203	DWC	3500	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.05	0.00	0.27			0.22	2.05	2.09	OK
968	1CRA RD M4.3	1CRA RD M4.2	0	1	H		21.00		21.00	2.314	2.314	2.61	2.61	2.25	0.068	0.000	0.068	10	200	203	DWC	7000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	1.21			1.09	1.10	1.22	OK
969	1CRA RD M4.2	1CRA RD M4.2.1	2	1	J		30.00		681.00	2.311	2.161	3.73	84.62	2.25	2.204	0.000	2.204	53	200	203	DWC	200	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	0.22	0.220		0.16	2.09	2.00	OK
970	1CRA RD M4.2.1	1CRA RD M4.2.2	1	1	C		30.00		711.00	2.161	2.157	3.73	88.35	2.25	2.301	0.000	2.301	55	200	203	DWC	7500	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	0.16			0.10	2.00	2.06	OK
971	1CRA RD M4.2.2	1CRA RD M4.2.3	1	1	C		30.00		741.00	2.157	2.102	3.73	92.08	2.25	2.398	0.000	2.398	56	200	203	DWC	545	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.06	0.00	0.10			0.04	2.06	2.06	OK
972	1CRA RD M4.2.3	1CRA RD M4.2.4	1	1	C		20.00		761.00	2.102	2.148	2.49	94.56	2.25	2.463	0.000	2.463	57	200	203	DWC	-435	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.04	0.00	0.04			0.00	2.06	2.15	OK
973	1CRA RD M4.2.4	3CR RD M9.6	1	1	C		20.00		781.00	2.148	2.194	2.49	97.05	2.25	2.527	0.000	2.527	57	200	203	DWC	-435	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.04	0.00	0.00			-0.04	2.15	2.23	OK
974	3CR RD M9.6	3CR RD M9.5	0	1	H		30.00		30.00	2.130	2.194	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	-469	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.03			0.86	1.10	1.33	OK
975	3CR RD M9.6	3CR RD M9.5	2	1	J		30.00		841.00	2.194	2.179	3.73	104.50	2.25	2.721	0.000	2.721	59	200	203	DWC	2000	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.06	0.00	-0.04	-0.040		-0.10	2.23	2.28	OK
976	3CR RD M9.5	3CR RD M9.4	1	1	C		20.00		861.00	2.179	2.165	2.49	106.99	2.25	2.786	0.000	2.786	60	200	203	DWC	1429	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.04	0.00	-0.10			-0.14	2.28	2.31	OK
977	1CR RD M4.5	1CR RD M4.4	0	1	H		14.00		14.00	2.340	2.356	1.74	1.74	2.25	0.045	0.000	0.045	8	200	203	DWC	-875	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	1.24			1.16	1.10	1.20	OK
978	1CR RD M4.4	3CR RD M9.4.4	1	1	C		11.00		25.00	2.356	2.284	1.37	3.11	2.25	0.081	0.000	0.081	11	200	203	DWC	153	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	1.16			1.10	1.20	1.18	OK
979	3CR RD M9.4.4	3CR RD M9.4.3	1	1	C		30.00		55.00	2.284	2.233	3.73	6.83	2.25	0.178	0.000	0.178	16	200	203	DWC	588	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.10			0.93	1.18	1.30	OK
980	3CR RD M9.4.3	3CR RD M9.4.2	1	1	C		30.00		85.00	2.233	2.174	3.73	10.56	2.25	0.275	0.000	0.275	19	200	203	DWC	508	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.93			0.76	1.30	1.41	OK
981	3CR RD M9.4.2	3CR RD M9.4.1	1	1	C		30.00		115.00	2.174	2.115	3.73	14.29	2.25	0.372	0.000	0.372	22	200	203	DWC	508	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.76			0.59	1.41	1.53	OK
982	3CR RD M9.4.1	3CR RD M9.4	1	1	C		30.00		145.00	2.115	2.165	3.73	18.02	2.25	0.469	0.000	0.469	25	200	203	DWC	-600	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.59			-0.42	1.53	1.75	OK
983	3CR RD M9.4	3CR RD M9.3	2	1	J		30.00		1036.00	2.165	2.096	3.73	128.74	2.25	3.352	0.000	3.352	66	200	203	DWC	435	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.06	0.00	-0.14	-0.140		-0.20	2.31	2.30	OK
984	3CR RD M9.3	3CR RD M9.2	1	1	C		22.00		1058.00	2.096	2.028	2.73	131.47	2.25	3.424	0.000	3.424	67	200	203	DWC	324	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.04	0.00	-0.20			-0.24	2.30	2.27	OK
985	3CR RD M9.2.7	3CR RD M9.2.6	0	1	H		32.00		32.00	2.064	2.145	3.98	3.98	2.25	0.104	0.000	0.104	12	200	203	DWC	-395	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.18	0.00	0.96			0.78	1.10	1.37	OK
986	3CR RD M3Aa	3CR RD M9.2.6	0	1	H		30.00		30.00	2.163	2.145	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	1667	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.06			0.89	1.10	1.26	OK
987	3CR RD M9.2.6	3CR RD M9.2.5	2	1	J		20.00		82.00	2.145	2.099	2.49	10.19	2.25	0.265	0.000	0.265	19	200	203	DWC	435	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.78	0.780		0.67	1.37	1.43	OK
988	3CR RD M9.2.5	3CR RD M9.2.4	1	1	C		20.00		102.00	2.099	2.033	2.49	12.67	2.25	0.330	0.000	0.330	21	200	203	DWC	303	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.67			0.			

Sl. No.	Man Holes				Ma nho le Typ e	MANH OLE TYPE	Length in m	CUMULATI VE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in 1 L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Check Velocity (0.6m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW1+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)/m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	From				To	Starting Manhole	Ending manhole			
1030	GNC-2CR RD M1	GNC RD M2	1	1	C		30.00	178.00	2.187	2.352	3.73	22.12	2.25	0.576	0.000	0.576	28	200	203	DWC	-182	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.41		0.34	1.78	2.01	OK		
1031	GNC RD M2	GNC-3CR RD M3	1	1	C		20.00	198.00	2.352	2.644	2.49	24.60	2.25	0.641	0.000	0.641	29	200	203	DWC	-68	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	0.34		0.29	2.01	2.35	OK		
1032	GNC-3CR RD M3	GNC RD M4	1	1	C		20.00	218.00	2.644	2.374	2.49	27.09	2.25	0.705	0.000	0.705	30	200	203	DWC	74	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	0.29		0.25	2.35	2.12	OK		
1033	GNC RD M4	GNC-4CR RD M5	1	1	C		22.00	240.00	2.374	2.098	2.73	29.82	2.25	0.777	0.000	0.777	32	200	203	DWC	80	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	0.25		0.21	2.12	1.89	OK		
1034	GNC-4CR RD M5	GNC RD M6	1	1	C		26.00	266.00	2.098	2.374	3.23	33.05	2.25	0.861	0.000	0.861	34	200	203	DWC	-94	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	0.21		0.16	1.89	2.21	OK		
1035	GNC RD M6	GNC-5CR RD M7	1	1	C		30.00	296.00	2.374	2.066	3.73	36.78	2.25	0.958	0.000	0.958	35	200	203	DWC	97	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	0.16		0.10	2.21	1.97	OK		
1036	GNC-5CR RD M7	GNC RD M8	1	1	C		30.00	326.00	2.066	2.143	3.73	40.51	2.25	1.055	0.000	1.055	37	200	203	DWC	-390	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	0.10		0.04	1.97	2.10	OK		
1037	GNC RD M8	GNC RD M9	1	1	C		20.00	346.00	2.143	2.220	2.49	42.99	2.25	1.120	0.000	1.120	38	200	203	DWC	-260	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	0.04		0.00	2.10	2.22	OK		
1038	GNC RD M9	GNC-MLC RD M10	1	1	C		19.00	365.00	2.220	2.167	2.36	45.36	2.25	1.181	0.000	1.181	39	200	203	DWC	358	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	0.00		-0.04	2.22	2.21	OK		
1039	MLC RD M3	MLC-GNCH RD M2	0	1	H		28.00	28.00	2.220	2.357	3.48	3.48	2.25	0.091	0.000	0.091	11	200	203	DWC	-204	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	1.12		0.96	1.10	1.40	OK		
1040	GNCH RD M3	GNCH RD M2	0	1	H		30.00	30.00	2.411	2.359	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	577	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.31		1.14	1.10	1.22	OK		
1041	GNCH RD M2	GNCH RD M1	1	1	C		30.00	60.00	2.359	2.358	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	30000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.14		0.97	1.22	1.39	OK		
1042	GNCH RD M1	MLC-GNCH RD M2	1	1	C		30.00	90.00	2.358	2.357	3.73	11.18	2.25	0.291	0.000	0.291	20	200	203	DWC	30000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.97		0.80	1.39	1.56	OK		
1043	MLC-GNCH RD M2	MLC RD M1	2	1	J		18.00	136.00	2.360	2.453	2.24	16.90	2.25	0.440	0.000	0.440	24	200	203	DWC	-194	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	0.80	0.800	0.70	1.56	1.75	OK		
1044	MLC RD M1	GNC-MLC RD M10	1	1	C		30.00	166.00	2.453	2.167	3.73	20.63	2.25	0.537	0.000	0.537	27	200	203	DWC	105	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.70		0.61	1.75	1.56	OK		
1045	GNC-MLC RD M10	GNC RD M11	2	1	J		25.00	556.00	2.167	2.352	3.11	69.09	2.25	1.799	0.000	1.799	48	200	203	DWC	-135	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.05	0.00	-0.04	-0.040	-0.09	2.21	2.44	OK		
1046	GNC RD M11	GNC RD M12	1	1	C		30.00	586.00	2.352	2.274	3.73	72.82	2.25	1.896	0.000	1.896	50	200	203	DWC	385	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	-0.09		-0.15	2.44	2.42	OK		
1047	GNC RD M12	GNC RD M13	1	1	C		30.00	616.00	2.274	2.254	3.73	76.55	2.25	1.993	0.000	1.993	51	200	203	DWC	1500	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	-0.15		-0.21	2.42	2.46	OK		
1048	GNC RD M13	GNC RD M14	1	1	C		30.00	646.00	2.254	2.252	3.73	80.27	2.25	2.090	0.000	2.090	52	200	203	DWC	15000	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	-0.21		-0.27	2.46	2.52	OK		
1049	GNC RD M14	GNC RD M15	1	1	C		30.00	676.00	2.252	2.266	3.73	84.00	2.25	2.188	0.000	2.188	53	200	203	DWC	-2143	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	-0.27		-0.33	2.52	2.60	OK		
1050	GNC RD M15	GNC-8CR RD M1	1	1	C		30.00	706.00	2.266	2.282	3.73	87.73	2.25	2.285	0.000	2.285	54	200	203	DWC	-1875	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	-0.33		-0.39	2.60				

Sl. No.	Man Holes				Ma nho le Typ e	MANH OLE TYPE	Length in m	CUMULATI VE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m		Depth of cutting in m		Check Depth of cutting	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s			Check Velocity (> 0.6m/s)	From	To	Starting Manhole		Ending manhole
1104	8CR RD M4	8CR RD M5	1	1	C		30.00	28074.00	2.273	2.273	3.73	3488.54	2.25	90.847	0.000	90.847	341	427	500	HDPE	0	1000	0.010	0.71	102.11	0.89	1.13	0.74	OK	0.80	OK	0.03	0.00	-2.65		-2.68	4.92	4.95	OK
1105	8CR RD M5	GN-8CR RD M6	1	1	C		30.00	28104.00	2.273	2.549	3.73	3492.27	2.25	90.944	0.000	90.944	341	427	500	HDPE	-109	1000	0.010	0.71	102.11	0.89	1.13	0.74	OK	0.80	OK	0.03	0.00	-2.68		-2.71	4.95	5.26	OK
1106	CRG RD M1.2	CRG RD M1.1	0	1	H		28.00	28.00	2.524	2.453	3.48	3.48	2.25	0.091	0.000	0.091	11	200	203	DWC	394	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	1.42		1.26	1.10	1.19	OK
1107	CRG RD M1.1	CRG RD M1	1	1	C		19.00	47.00	2.453	2.420	2.36	5.84	2.25	0.152	0.000	0.152	14	200	203	DWC	576	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.26		1.15	1.19	1.27	OK
1108	CRG RD M1	CRG RD M2	1	1	C		20.00	67.00	2.420	2.404	2.49	8.33	2.25	0.217	0.000	0.217	17	200	203	DWC	1250	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.15		1.04	1.27	1.36	OK
1109	CRG RD M2	11CR RD M2	1	1	C		30.00	97.00	2.404	2.366	3.73	12.05	2.25	0.314	0.000	0.314	20	200	203	DWC	789	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.04		0.87	1.36	1.50	OK
1110	11CR RD M2	11CR RD M1	1	1	C		30.00	127.00	2.360	2.393	3.73	15.78	2.25	0.411	0.000	0.411	23	200	203	DWC	-909	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.87		0.70	1.49	1.69	OK
1111	11CR RD M1	GNCH-11CR RD M10	1	1	C		30.00	157.00	2.393	2.390	3.73	19.51	2.25	0.508	0.000	0.508	26	200	203	DWC	10000	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.70		0.61	1.69	1.78	OK
1112	GNCH-11CR RD M10	GNCH RD M9	1	1	C		22.00	179.00	2.390	2.418	2.73	22.24	2.25	0.579	0.000	0.579	28	200	203	DWC	-786	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	0.61		0.56	1.78	1.86	OK
1113	GNCH RD M9	GNCH-10CR RD M8	1	1	C		30.00	209.00	2.420	2.274	3.73	25.97	2.25	0.676	0.000	0.676	30	200	203	DWC	205	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.56		0.49	1.86	1.78	OK
1114	GNCH-10CR RD M8	10CR RD M1	1	1	C		30.00	239.00	2.274	2.366	3.73	29.70	2.25	0.773	0.000	0.773	32	200	203	DWC	-326	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.49		0.43	1.78	1.94	OK
1115	10CR RD M1	10CR RD M2	1	1	C		30.00	269.00	2.366	2.330	3.73	33.43	2.25	0.870	0.000	0.870	34	200	203	DWC	833	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	0.43		0.37	1.94	1.96	OK
1116	10CR RD M2	GN-10CR RD M8	1	1	C		21.00	290.00	2.330	2.309	2.61	36.04	2.25	0.938	0.000	0.938	35	200	203	DWC	1000	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	0.37		0.33	1.96	1.98	OK
1117	KH RD M4	KH RD M3	0	1	H		30.00	30.00	2.931	2.661	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	111	111	0.010	1.29	40.55	0.00	0.30	0.07	OK	0.39	OK	0.27	0.00	1.83		1.56	1.10	1.10	OK
1118	KH RD M3	KH RD M2	1	1	C		30.00	60.00	2.661	2.351	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	97	97	0.010	1.38	43.38	0.00	0.30	0.07	OK	0.41	OK	0.31	0.00	1.56		1.25	1.10	1.10	OK
1119	KH RD M2	KH RD M1	1	1	C		30.00	90.00	2.351	2.330	3.73	11.18	2.25	0.291	0.000	0.291	20	200	203	DWC	1429	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.25		1.08	1.10	1.25	OK
1120	KH RD M1	GN-10CR RD M8	1	1	C		32.00	122.00	2.330	2.309	3.98	15.16	2.25	0.395	0.000	0.395	23	200	203	DWC	1524	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	1.08		0.90	1.25	1.41	OK
1121	GN-10CR RD M8	GN-9CR RD M7	2	1	J		30.00	442.00	2.309	2.281	3.73	54.92	2.25	1.430	0.000	1.430	43	200	203	DWC	1071	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	0.33	0.330	0.27	1.98	2.01	OK
1122	GNCH-9CR RD M7	9CRA RD M1	0	1	H		30.00	30.00	2.454	2.380	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	405	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.35		1.18	1.10	1.20	OK
1123	9CRA RD M1	9CRA RD M2	1	1	C		20.00	50.00	2.380	2.314	2.49	6.21	2.25	0.162	0.000	0.162	15	200	203	DWC	303	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.18		1.07	1.20	1.24	OK
1124	9CRA RD M2	GN-9CR RD M7	1	1	C		29.00	79.00	2.314	2.281	3.60	9.82	2.25	0.256	0.000	0.256	19	200	203	DWC	879	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	1.07		0.91	1.24	1.37	OK
1125	GN-9CR RD M7	GN RD M6	2	1	J		30.00	551.00	2.281	2.253	3.73	68.47	2.25	1.783	0.000	1.783	48	200	203	DWC	1071	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	0.27	0.270	0.21	2.01	2.04	OK
1126	GN RD M6	GN-8CR RD M6	1	1	C		30.00	581.00	2.253	2.549	3.73	72.20	2.25	1.880	0.000	1.880	49	200	203	DWC	-101	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	0.21		0.15	2.04	2.40	OK
1127	GN-8CR RD M6	GN-8CR RD M7	2	1	J		10.00	28695.00	2.549	2.417	1.24	3565.71	2.25	92.857	0.000	92.857	344	427	500	HDPE	76	1000	0.010	0.71	102.11	0.91	1.13	0.75	OK	0.80	OK	0.01	0.00	-2.71	-2.710	-2.72	5.26	5.14	OK
1128	8CR RD M11	8CR RD M10	0	1	H		30.00	30.00	3.241	2.946	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	102	101	0.010	1.35	42.51	0.00	0.30	0.07	OK	0.41	OK	0.30	0.00	2.14		1.84	1.10	1.11	OK
1129	8CR RD M10	8CR RD M9	1	1	C		30.00	60.00	2.946	2.651	3.73	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	102	101	0.010	1.35	42.51	0.00	0.30	0.07	OK	0.41	OK	0.30	0.00	1.84		1.54	1.11	1.11	OK
1130	8CR RD M9	8CR RD M8	1	1	C		30.00	90.00	2.651	2.561	3.73	11.18	2.25	0.291	0.000	0.291	20	200	203	DWC	333	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.54		1.37	1.11	1.19	OK
1131	8CR RD M8	GN-8CR RD M7	1	1	C		30.00	120.00	2.561	2.417	3.73	14.91	2.25	0.388	0.000	0.388	23	200	203	DWC	208	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.37		1.20	1.19	1.22	OK
	GN-8CR RD M7	PM	2	0	J		5.00	28820.00	2.417	2.471	0.62	3581.24	2.25	93.261	0.000	93.261	345	427	500	HDPE	-93	1000	0.010	0.71	102.11	0.91	1.13	0.75	OK	0.80	OK	0.01	0.00	-2.72	-2.720	-2.73	5.14	5.20	OK
							28820.00	0	28820.00					3581.24																									

SEWER NETWORK DESIGN - ELAMKULAM BLOCK 9

Man Holes		Man hole Typ e	MANHOLE TYPE	Length in m	CUMULAT IVE LENGTH IN M	Cumulativ e length in m	Ground Levels		FLOWS LPS	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per	At Ultimate peak flow		Check Veloci ty (> 0.3m/s)	Invert Level in m			Depth of cutting in m		Check Depth of cutting
From	To						check (d/D< 0.7)	Actual Velocity (v1) m/s			From	To				Starting Manhole	Ending Manhole	Total Flow		ID	OD				
4	5	8	9	10.00	11	12	13.000	14.000	20	21	22	23	24	25	26	28	33	34	35	38	39	40	41	42	43
UDN RD M24	UDN RD M23	H		30		30.00	2.09	2.066	0.104	12	200	203	DWC	1250	180	1.01	OK	0.30	OK	0.99		0.82	1.10	1.25	OK
UDN RD M23	UDN RD M22	C		30		60.00	2.066	1.944	0.208	17	200	203	DWC	246	180	1.01	OK	0.30	OK	0.82		0.65	1.25	1.29	OK
UDN RD M22	UDN RD M21	C			11.687	71.69	1.944	1.875	0.248	18	200	203	DWC	169	180	1.01	OK	0.30	OK	0.65		0.59	1.29	1.29	OK
UDN RD M21.6	UDN RD M21.5	H		19.893		19.89	1.99	1.962	0.069	10	200	203	DWC	710	180	1.01	OK	0.30	OK	0.89		0.78	1.10	1.18	OK
UDN RD M21.5	UDN RD M21.4	C		25.732		45.63	1.962	1.948	0.158	15	200	203	DWC	1838	180	1.01	OK	0.30	OK	0.78		0.64	1.18	1.31	OK
UDN RD M21.4	UDN RD M21.3	C		19.496		65.12	1.948	1.933	0.225	17	200	203	DWC	1300	180	1.01	OK	0.30	OK	0.64		0.53	1.31	1.40	OK
UDN RD M21.3	UDN RD M21.2	C		30		95.12	1.933	1.904	0.329	21	200	203	DWC	1034	180	1.01	OK	0.30	OK	0.53		0.36	1.40	1.54	OK
UDN RD M21.2	UDN RD M21.1	C		28.582		123.70	1.904	1.889	0.428	24	200	203	DWC	1905	180	1.01	OK	0.30	OK	0.36		0.20	1.54	1.69	OK
UDN RD M21.1	UDN RD M21	C		30		153.70	1.889	1.875	0.532	27	200	203	DWC	2143	420	0.66	OK	0.30	OK	0.20		0.13	1.69	1.75	OK
UDN RD M21	UDN RD M20	J		30		255.39	1.875	1.893	0.884	34	200	203	DWC	-1667	520	0.60	OK	0.32	OK	0.13	0.13	0.07	1.75	1.82	OK
UDN RD M20	UDN RD M19	C		30		285.39	1.893	1.494	0.988	36	200	203	DWC	75	520	0.60	OK	0.32	OK	0.07		0.01	1.82	1.48	OK
UDN RD M19	UDN RD M18	C		36.83		322.22	1.494	1.095	1.115	38	200	203	DWC	92	520	0.60	OK	0.33	OK	0.01		-0.06	1.48	1.16	OK
UDN RD M18.2	UDN RD M18.1	H		20		20.00	0.802	0.805	0.069	10	200	203	DWC	-6667	180	1.01	OK	0.30	OK	-0.30		-0.41	1.10	1.22	OK
UDN RD M15.1	UDN RD M18.1.2	H		20.399		20.40	0.72	0.782	0.071	10	200	203	DWC	-329	180	1.01	OK	0.30	OK	-0.38		-0.49	1.10	1.27	OK
UDN RD M18.5	UDN RD M18.1.2	H		20.949		20.95	0.631	0.782	0.072	10	200	203	DWC	-139	180	1.01	OK	0.30	OK	-0.47		-0.59	1.10	1.37	OK
UDN RD M18.1.2	UDN RD M18.1.1	J		25.195		66.54	0.782	0.794	0.230	18	200	203	DWC	-2100	180	1.01	OK	0.30	OK	-0.59	-0.59	-0.73	1.37	1.52	OK
UDN RD M18.4.1	UDN RD M18.1.1	H		21.105		21.11	0.662	0.794	0.073	10	200	203	DWC	-160	180	1.01	OK	0.30	OK	-0.44		-0.56	1.10	1.35	OK
UDN RD M18.1.1	UDN RD M18.1	J		23.927		111.58	0.794	0.805	0.386	23	200	203	DWC	-2175	180	1.01	OK	0.30	OK	-0.73	-0.73	-0.86	1.52	1.67	OK
UDN RD M18.1	UDN RD M18	J		31.173		162.75	0.805	1.09	0.563	27	200	203	DWC	-109	320	0.76	OK	0.30	OK	-0.86	-0.86	-0.96	1.67	2.05	OK
UDN RD M18	UDN RD M17	J		26.705		511.67	1.09	0.969	1.771	48	200	203	DWC	221	520	0.60	OK	0.37	OK	-0.96	-0.96	-1.01	2.05	1.98	OK
UDN RD M17	UDN RD M16	C		20		531.67	0.969	1.431	1.840	49	200	203	DWC	-43	520	0.60	OK	0.39	OK	-1.01		-1.05	1.98	2.48	OK
UDN RD M16	UDN RD M15	C		25.635		557.31	1.431	1.112	1.928	50	200	203	DWC	80	520	0.60	OK	0.39	OK	-1.05		-1.10	2.48	2.21	OK
UDN RD M15	UDN RD M14	C		23.788		581.10	1.112	1.033	2.011	51	200	203	DWC	301	520	0.60	OK	0.40	OK	-1.10		-1.15	2.21	2.18	OK
UDN RD M14	UDN RD M13	C		22.673		603.77	1.033	1.243	2.089	52	200	203	DWC	-108	520	0.60	OK	0.40	OK	-1.15		-1.19	2.18	2.43	OK
UDN RD M13.1	UDN RD M13	H		17.684		17.68	0.99	1.243	0.061	9	200	203	DWC	-70	180	1.01	OK	0.30	OK	-0.11		-0.21	1.10	1.45	OK
UDN RD M13	UDN RD M12	J		30.052		651.51	1.243	1.063	2.254	54	200	203	DWC	167	520	0.60	OK	0.41	OK	-1.19	-1.19	-1.25	2.43	2.31	OK
UDN RD M12	UDN RD M11	C		20		671.51	1.063	1.121	2.324	55	200	203	DWC	-345	520	0.60	OK	0.41	OK	-1.25		-1.29	2.31	2.41	OK
UDN RD M11	UDN-BNK RD M10	C		26.162		697.67	1.121	1.14	2.414	56	200	203	DWC	-1377	520	0.60	OK	0.42	OK	-1.29		-1.34	2.41	2.48	OK
MAV RD M15	MAV RD M16	H		30		30.00	2.352	2.357	0.104	12	200	203	DWC	-6000	180	1.01	OK	0.30	OK	1.25		1.08	1.10	1.28	OK
MAV RD M16	MAV RD M17	C		30		60.00	2.357	2.362	0.208	17	200	203	DWC	-6000	180	1.01	OK	0.30	OK	1.08		0.91	1.28	1.45	OK
MAV RD M17	BNK RD M3	C		28.911		88.91	2.362	2.353	0.308	20	200	203	DWC	3212	180	1.01	OK	0.30	OK	0.91		0.75	1.45	1.60	OK
BNK RD M3	BNK RD M2	C		30		118.91	2.353	2.027	0.411	23	200	203	DWC	92	180	1.01	OK	0.30	OK	0.75		0.58	1.60	1.45	OK
BNK RD M2	BNK RD M1	C		30		148.91	2.027	1.7	0.515	26	200	203	DWC	92	320	0.76	OK	0.30	OK	0.58		0.49	1.45	1.21	OK
BNK RD M1	UDN-BNK RD M10	C		30		178.91	1.7	1.14	0.619	29	200	203	DWC	54	65	1.68	OK	0.51	OK	0.49		0.03	1.21	1.11	OK
UDN-BNK RD M10	UDN RD M9	J		30.017		906.60	1.14	1.103	3.137	64	200	203	DWC	811	520	0.60	OK	0.45	OK	-1.34	-1.34	-1.40	2.48	2.50	OK
UDN RD M9	UDN RD M 8	C		30		936.60	1.103	1.091	3.241	65	200	203	DWC	2500	520	0.60	OK	0.45	OK	-1.40		-1.46	2.50	2.55	OK
UDN RD M 8	UDN RD M7	C		30		966.60	1.091	1.045	3.345	66	200	203	DWC	652	520	0.60	OK	0.45	OK	-1.46		-1.52	2.55	2.57	OK
UDN RD M7	UDN RD M6	C		30		996.60	1.045	1.946	3.449	67	200	203	DWC	-33	520	0.60	OK	0.45	OK	-1.52		-1.58	2.57	3.53	OK
UDN RD M6	UDN RD M5	C		30		1026.60	1.946	2.19	3.552	68	200	203	DWC	-123	520	0.60	OK								

Man Holes		Man hole Type	MANHOLE TYPE	Length in m	CUMULAT IVE LENGTH IN M	Cumulativ e length in m	Ground Levels		FLOWS LPS	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per Manni	At Ultimate peak flow		Check Veloci ty (> 0.3m/	Invert Level in m			Depth of cutting in m		Check Depth of cutting
From	To						Starting Manhole	Ending Manhole	Total Flow		ID	OD				Veloci ty (V)m/ s	check (d/D< 0.7)	Actual Velocity (v1) m/s		From		To	Starting Manhole	Ending manhole	
SA RD M7	SA RD M6	J		32		448.00	1.493	1.536	1.550	45	200	203	DWC	-744	520	0.60	OK	0.36	OK	-0.76	-0.76	-0.82	2.25	2.36	OK
SA RD M6	SA RD M5	C		30		478.00	1.536	1.58	1.654	46	200	203	DWC	-682	520	0.60	OK	0.37	OK	-0.82		-0.88	2.36	2.46	OK
SA RD M5	SA RD M4	C		30		508.00	1.58	1.726	1.758	48	200	203	DWC	-205	520	0.60	OK	0.37	OK	-0.88		-0.94	2.46	2.67	OK
SA RD M4	SA RD M3	C		30		538.00	1.726	1.816	1.862	49	200	203	DWC	-333	520	0.60	OK	0.39	OK	-0.94		-1.00	2.67	2.82	OK
SA RD M3	SA RD M2	C		30		568.00	1.816	2.126	1.965	51	200	203	DWC	-97	520	0.60	OK	0.39	OK	-1.00		-1.06	2.82	3.19	OK
SA RD M2	SA RD M1	C		30		598.00	2.126	2.294	2.069	52	200	203	DWC	-179	520	0.60	OK	0.40	OK	-1.06		-1.12	3.19	3.41	OK
SA RD M25	SA RD M24	H		22		22.00	2.294	1.99	0.076	10	200	203	DWC	72	72	1.60	OK	0.48	OK	1.19		0.88	1.10	1.11	OK
SA RD M24	SA RD M23	C		30		52.00	1.99	1.92	0.180	16	200	203	DWC	429	180	1.01	OK	0.30	OK	0.88		0.71	1.11	1.21	OK
SA RD M23	SA RD M22	C		30		82.00	1.92	1.77	0.284	20	200	203	DWC	200	180	1.01	OK	0.30	OK	0.71		0.54	1.21	1.23	OK
SA RD M22	SA RD M21	C		30		112.00	1.77	2.17	0.388	23	200	203	DWC	-75	180	1.01	OK	0.30	OK	0.54		0.37	1.23	1.80	OK
SA RD M21	SA RD M20	C		30		142.00	2.17	2.19	0.491	26	200	203	DWC	-1500	320	0.76	OK	0.30	OK	0.37		0.28	1.80	1.91	OK
SA RD M20	SA RD M19	C		30		172.00	2.19	3.187	0.595	28	200	203	DWC	-30	420	0.66	OK	0.30	OK	0.28		0.21	1.91	2.98	OK
SA RD M19	SA RD M19A	C		18		190.00	3.187	2.742	0.657	29	200	203	DWC	40	520	0.60	OK	0.30	OK	0.21		0.18	2.98	2.56	OK
SA RD M19A	SA RD M1	C		20		210.00	2.742	2.296	0.727	31	200	203	DWC	45	520	0.60	OK	0.30	OK	0.18		0.14	2.56	2.16	OK
SA RD M1	SA RD M1.1	J		25		833.00	2.296	2.254	2.882	61	200	203	DWC	595	520	0.60	OK	0.43	OK	-1.12	-1.12	-1.17	3.42	3.42	OK
SA RD M1.1	SA RD M1.2	C		25		858.00	2.254	2.557	2.969	62	200	203	DWC	-83	520	0.60	OK	0.44	OK	-1.17		-1.22	3.42	3.78	OK
TP LN RD M1	TP LN RD M2	H		30		30.00	2.144	2.155	0.104	12	200	203	DWC	-2727	180	1.01	OK	0.30	OK	1.04		0.87	1.10	1.29	OK
TP LN RD M2	TP LN RD M3	C		24		54.00	2.155	2.207	0.187	16	200	203	DWC	-462	180	1.01	OK	0.30	OK	0.87		0.74	1.29	1.47	OK
TP LN RD M3	TP LN RD M4	C		22		76.00	2.207	2.274	0.263	19	200	203	DWC	-328	180	1.01	OK	0.30	OK	0.74		0.62	1.47	1.65	OK
TP LN RD M4	TP LN RD M5	C		30		106.00	2.274	2.307	0.367	22	200	203	DWC	-909	180	1.01	OK	0.30	OK	0.62		0.45	1.65	1.86	OK
TP LN RD M5	TP LN RD M6	C		9		115.00	2.307	2.233	0.398	23	200	203	DWC	122	180	1.01	OK	0.30	OK	0.45		0.40	1.86	1.83	OK
TP LN RD M6.2	TP LN RD M6.1	H		31		31.00	2.084	2.228	0.107	12	200	203	DWC	-215	180	1.01	OK	0.30	OK	0.98		0.81	1.10	1.42	OK
TP LN RD M6.1	TP LN RD M6	C		30		61.00	2.228	2.233	0.211	17	200	203	DWC	-6000	180	1.01	OK	0.30	OK	0.81		0.64	1.42	1.59	OK
TP LN RD M6.3	TP LN RD M6	H		19		19.00	2.282	2.233	0.066	10	200	203	DWC	388	180	1.01	OK	0.30	OK	1.18		1.07	1.10	1.16	OK
TP LN RD M6	TP LN RD M7	J		33		228.00	2.233	2.418	0.789	32	200	203	DWC	-178	520	0.60	OK	0.30	OK	0.40	0.40	0.34	1.83	2.08	OK
TP LN RD M7	TP LN RD M8	C		17		245.00	2.418	2.553	0.848	33	200	203	DWC	-126	520	0.60	OK	0.32	OK	0.34		0.31	2.08	2.24	OK
TP LN RD M8	SA RD M1.2	C		24		269.00	2.553	2.56	0.931	35	200	203	DWC	-3429	520	0.60	OK	0.32	OK	0.31		0.26	2.24	2.30	OK
SA RD M1.2	SA RD M1.3	J		30		1157.00	2.56	2.77	4.004	72	200	203	DWC	-143	520	0.60	OK	0.47	OK	-1.22	-1.22	-1.28	3.78	4.05	OK
SA RD M1.3	SA RD M1.4	C		30		1187.00	2.77	2.715	4.107	73	200	203	DWC	545	520	0.60	OK	0.48	OK	-1.28		-1.34	4.05	4.06	OK
SA RD M1.4	SA RD M1.5	C		30		1217.00	2.715	2.761	4.211	74	200	203	DWC	-652	520	0.60	OK	0.48	OK	-1.34		-1.40	4.06	4.16	OK
SA RD M1.5	SA RD M1.6	C		30		1247.00	2.761	2.687	4.315	75	200	203	DWC	405	520	0.60	OK	0.48	OK	-1.40		-1.46	4.16	4.15	OK
SA RD M1.6	SA RD M1.7	C		25		1272.00	2.687	2.299	4.402	75	200	203	DWC	64	520	0.60	OK	0.48	OK	-1.46		-1.51	4.15	3.81	OK
SA RD M1.7	KR RD M11	C		15		1287.00	2.299	2.323	4.454	76	200	203	DWC	-625	520	0.60	OK	0.49	OK	-1.51		-1.54	3.81	3.86	OK
KR RD M11	KR RD M10	C		30		1317.00	2.323	2.215	4.557	77	200	203	DWC	278	520	0.60	OK	0.49	OK	-1.54		-1.60	3.86	3.82	OK
KR RD M10	KR RD M9	C		30		1347.00	2.215	2.181	4.661	78	200	203	DWC	882	520	0.60	OK	0.50	OK	-1.60		-1.66	3.82	3.84	OK
KR RD M9.3	KR RD M9.2	H		20		20.00	1.904	1.979	0.069	10	200	203	DWC	-267	180	1.01	OK	0.30	OK	0.80		0.69	1.10	1.29	OK
KR RD M9.2	KR RD M9.1	C		10		30.00	1.979	2.046	0.104	12	200	203	DWC	-149	180	1.01	OK	0.30	OK	0.69		0.63	1.29	1.42	OK
KR RD M9.1	KR RD M9	C		25		55.00	2.046	2.181	0.190	16	200	203	DWC	-185	180	1.01	OK	0.30	OK	0.63		0.49	1.42	1.69	OK
KR RD M9	KR RD M8	J		25		1427.00	2.181	2.086	4.938	80	200	203	DWC	263	520	0.60	OK	0.50	OK	-1.66	-1.66	-1.71	3.84	3.80	OK
KR RD M8	KR RD M7	C		18		1445.00</																			

Man Holes		Man hole Type	MANHOLE TYPE	Length in m	CUMULAT IVE LENGTH IN M	Cumulativ e length in m	Ground Levels		FLOWS LPS Total Flow	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per Manni Veloci ty (V)m/ s	At Ultimate peak flow		Check Veloci ty (> 0.3m/ s)	Invert Level in m			Depth of cutting in m		Check Depth of cutting
From	To						Starting Manhole	Ending Manhole			ID	OD					check (d/D< 0.7)	Actual Velocity (v1) m/s		From		To	Starting Manhole	Ending manhole	
KH RD M11	KH RD M12	C		20		2028.00	1.979	1.939	7.018	95	200	203	DWC	500	520	0.60	OK	0.55	OK	0.19		0.15	1.79	1.79	OK
KH RD M12	KH RD M13	C		19		2047.00	1.939	1.966	7.083	95	200	203	DWC	-704	520	0.60	OK	0.55	OK	0.15		0.11	1.79	1.86	OK
KH RD M16	KH-PRD RD M16	H		18		18.00	2.233	2.286	0.062	9	200	203	DWC	-340	180	1.01	OK	0.30	OK	1.13		1.03	1.10	1.26	OK
KH-PRD RD M16	KH RD M15	C		20		38.00	2.286	2.111	0.131	13	200	203	DWC	114	180	1.01	OK	0.30	OK	1.03		0.92	1.26	1.19	OK
KH RD M15	KH RD M14	C		30		68.00	2.111	1.993	0.235	18	200	203	DWC	254	180	1.01	OK	0.30	OK	0.92		0.75	1.19	1.24	OK
KH RD M14	KH RD M13	C		30		98.00	1.993	1.966	0.339	21	200	203	DWC	1111	180	1.01	OK	0.30	OK	0.75		0.58	1.24	1.39	OK
KH RD M13	KH RD M13.1	J		30		2175.00	1.966	1.882	7.526	98	200	203	DWC	357	520	0.60	OK	0.56	OK	0.11	0.11	0.05	1.86	1.83	OK
KH RD M13.1	KH RD M13.2	C		30		2205.00	1.882	1.756	7.630	99	200	203	DWC	238	520	0.60	OK	0.57	OK	0.05		-0.01	1.83	1.77	OK
KH RD M13.2	KH RD M13.3	C		30		2235.00	1.756	1.724	7.734	100	200	203	DWC	937	520	0.60	OK	0.57	OK	-0.01		-0.07	1.77	1.79	OK
KH RD M13.3	KH RD M13.4	C		30		2265.00	1.724	1.704	7.838	100	200	203	DWC	1500	520	0.60	OK	0.57	OK	-0.07		-0.13	1.79	1.83	OK
KH RD M13.4	KH RD M13.5	C		30		2295.00	1.704	1.705	7.942	101	200	203	DWC	-30000	520	0.60	OK	0.57	OK	-0.13		-0.19	1.83	1.90	OK
KH RD M13.5	KH RD M13.6	C		30		2325.00	1.705	1.714	8.045	102	200	203	DWC	-3333	520	0.60	OK	0.58	OK	-0.19		-0.25	1.90	1.96	OK
KH RD M13.6	KH-PRD M M5	C		31		2356.00	1.714	1.857	8.153	102	200	203	DWC	-217	520	0.60	OK	0.58	OK	-0.25		-0.31	1.96	2.17	OK
PRD M M1	PRD M M2	H		30		30.00	2.251	2.165	0.104	12	200	203	DWC	349	180	1.01	OK	0.30	OK	1.15		0.98	1.10	1.19	OK
PRD M M2	PRD M M3	C		30		60.00	2.165	2.031	0.208	17	200	203	DWC	224	180	1.01	OK	0.30	OK	0.98		0.81	1.19	1.22	OK
PRD M M3	PRD M M4	C		20		80.00	2.031	1.944	0.277	19	200	203	DWC	230	180	1.01	OK	0.30	OK	0.81		0.70	1.22	1.24	OK
PRD M M4	KH-PRD M M5	C		28		108.00	1.944	1.857	0.374	22	200	203	DWC	322	180	1.01	OK	0.30	OK	0.70		0.54	1.24	1.32	OK
KH-PRD M M5	KH RD M17.5A	J		20		2484.00	1.857	1.822	8.596	105	200	203	DWC	571	520	0.60	OK	0.58	OK	-0.31	-0.31	-0.35	2.17	2.17	OK
KH RD M17.5A	KH RD M17.5	C		18		2502.00	1.822	1.843	8.658	106	200	203	DWC	-857	520	0.60	OK	0.58	OK	-0.35		-0.38	2.17	2.22	OK
KH RD M18	KH RD M17	H		30		30.00	2.341	2.18	0.104	12	200	203	DWC	186	180	1.01	OK	0.30	OK	1.24		1.07	1.10	1.11	OK
KH RD M17	KH RD M17.1	C		21		51.00	2.18	1.85	0.176	15	200	203	DWC	64	65	1.68	OK	0.51	OK	1.07		0.75	1.11	1.10	OK
KH RD M17.1	KH RD M17.2	C		20		71.00	1.85	1.83	0.246	18	200	203	DWC	1000	180	1.01	OK	0.30	OK	0.75		0.64	1.10	1.19	OK
KH RD M17.2	KH RD M17.3	C		30		101.00	1.83	1.811	0.349	22	200	203	DWC	1579	180	1.01	OK	0.30	OK	0.64		0.47	1.19	1.34	OK
KH RD M17.3	KH RD M17.4	C		30		131.00	1.811	1.827	0.453	25	200	203	DWC	-1875	180	1.01	OK	0.30	OK	0.47		0.30	1.34	1.53	OK
KH RD M17.4	KH RD M17.5	C		30		161.00	1.827	1.843	0.557	27	200	203	DWC	-1875	320	0.76	OK	0.30	OK	0.30		0.21	1.53	1.63	OK
KH RD M17.5	KH RD M17.6	J		15		2678.00	1.843	1.835	9.267	109	200	203	DWC	1875	520	0.60	OK	0.59	OK	-0.38	-0.38	-0.41	2.22	2.25	OK
KH RD M17.6	KH RD M17.7	C		30		2708.00	1.835	1.843	9.371	110	200	203	DWC	-3750	520	0.60	OK	0.60	OK	-0.41		-0.47	2.25	2.31	OK
KH RD M17.7	KH RD M17.8	C		30		2738.00	1.843	1.782	9.475	110	200	203	DWC	492	520	0.60	OK	0.60	OK	-0.47		-0.53	2.31	2.31	OK
KH RD M17.8	MV-KH RD M8	C		30		2768.00	1.782	1.861	9.578	111	200	203	DWC	-380	520	0.60	OK	0.60	OK	-0.53		-0.59	2.31	2.45	OK
PRD M M6	PRD M M7	H		34		34.00	1.86	1.851	0.118	13	200	203	DWC	3778	180	1.01	OK	0.30	OK	0.76		0.57	1.10	1.28	OK
PRD M M7.1	PRD M M7	H		30		30.00	1.924	1.851	0.104	12	200	203	DWC	411	180	1.01	OK	0.30	OK	0.82		0.65	1.10	1.20	OK
PRD M M7	PRD M M8	J		19		83.00	1.851	1.873	0.287	20	200	203	DWC	-864	180	1.01	OK	0.30	OK	0.57	0.57	0.46	1.28	1.41	OK
PRD M M8.2	PRD M M8.1	H		20		20.00	1.764	1.737	0.069	10	200	203	DWC	741	180	1.01	OK	0.30	OK	0.66		0.55	1.10	1.19	OK
PRD M M8.1	PRD M M8	C		20		40.00	1.737	1.873	0.138	14	200	203	DWC	-147	180	1.01	OK	0.30	OK	0.55		0.44	1.19	1.43	OK
PRD M M8	PRD M M9	J		20		143.00	1.873	1.944	0.495	26	200	203	DWC	-282	320	0.76	OK	0.30	OK	0.44	0.44	0.38	1.43	1.56	OK
PRD M M9	PM-MV RD M10	C		18		161.00	1.944	1.855	0.557	27	200	203	DWC	202	420	0.66	OK	0.30	OK	0.38		0.34	1.56	1.52	OK
PM-MV RD M10.3	PM-MV RD M10.2	H		20		20.00	1.864	1.826	0.069	10	200	203	DWC	526	180	1.01	OK	0.30	OK	0.76		0.65	1.10	1.18	OK
PM-MV RD M10.2	PM-MV RD M10.1	C		22		42.00	1.826	1.808	0.145	14	200	203	DWC	1222	180	1.01	OK	0.30	OK	0.65		0.53	1.18	1.28	OK
PM-MV RD M10.1	PM-MV RD M10	C		17		59.00	1.808	1.855	0.204	17	200	203	DWC	-362	180	1.01	OK	0.30	OK	0.53		0.44	1.28	1.42	OK
PM-MV RD M10	MV RD M1	J		28		248.00	1.855	1.774	0.858	34	200	203	DWC	346	520	0.60	OK	0.32	OK	0.34					

Man Holes		Man hole Type	MANHOLE TYPE	Length in m	CUMULAT IVE LENGTH IN M	Cumulativ e length in m	Ground Levels		FLOWS LPS Total Flow	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per Manni Veloci ty (V)m/ s	At Ultimate peak flow		Check Veloci ty (> 0.3m/s)	Invert Level in m			Depth of cutting in m		Check Depth of cutting
From	To						Starting Manhole	Ending Manhole			ID	OD					check (d/D< 0.7)	Actual Velocity (v1) m/s		From		To	Starting Manhole	Ending manhole	
KH RD M24	KH RD M23	C		30		211.00	1.928	1.742	0.730	31	200	203	DWC	161	520	0.60	OK	0.30	OK	-0.13		-0.19	2.06	1.93	OK
KH RD M23	KH RD M22	C		12		223.00	1.742	1.731	0.772	32	200	203	DWC	1091	520	0.60	OK	0.30	OK	-0.19		-0.21	1.93	1.94	OK
KH RD M22	KH RD M21	C		30		253.00	1.731	1.977	0.875	34	200	203	DWC	-122	520	0.60	OK	0.32	OK	-0.21		-0.27	1.94	2.25	OK
KH RD M19	KH RD M20	H		30		30.00	2.064	2.021	0.104	12	200	203	DWC	698	180	1.01	OK	0.30	OK	0.96		0.79	1.10	1.23	OK
KH RD M20	KH RD M21	C		17		47.00	2.021	1.977	0.163	15	200	203	DWC	386	180	1.01	OK	0.30	OK	0.79		0.70	1.23	1.28	OK
KH RD M21	KH RD M21.1	J		30		330.00	1.977	1.932	1.142	39	200	203	DWC	667	520	0.60	OK	0.33	OK	-0.27	-0.27	-0.33	2.25	2.26	OK
KH RD M21.1	KH RD M21.2	C		30		360.00	1.932	1.843	1.246	40	200	203	DWC	337	520	0.60	OK	0.35	OK	-0.33		-0.39	2.26	2.23	OK
KH RD M21.2	KH RD M21.3	C		30		390.00	1.843	1.799	1.350	42	200	203	DWC	682	520	0.60	OK	0.35	OK	-0.39		-0.45	2.23	2.25	OK
KH RD M21.3	MV-KH RD M8	C		32		422.00	1.799	1.861	1.460	44	200	203	DWC	-516	520	0.60	OK	0.36	OK	-0.45		-0.51	2.25	2.37	OK
MV-KH RD M8	MV-KH RD M8.1	J		30		3768.00	1.861	2.47	13.039	129	200	203	DWC	-49	520	0.60	OK	0.64	OK	-0.59	-0.59	-0.65	2.45	3.12	OK
MV-KH RD M8.1	UDN-WAR RD M1	C		40		3808.00	2.47	2.793	13.177	130	200	203	DWC	-124	520	0.60	OK	0.64	OK	-0.65		-0.73	3.12	3.52	OK
UDN-WAR RD M1	WAR RD M13	J		32		4980.59	2.793	1.987	17.235	149	250	253	DWC	40	700	0.60	OK	0.62	OK	-0.73	-0.73	-0.78	3.52	2.77	OK
WAR RD M13	WAR RD M12	C		30		5010.59	1.987	2.097	17.339	149	250	253	DWC	-273	700	0.60	OK	0.62	OK	-0.78		-0.82	2.77	2.92	OK
WAR RD M12	WAR RD M11	C		27.632		5038.22	2.097	2.302	17.434	150	250	253	DWC	-135	700	0.60	OK	0.62	OK	-0.82		-0.86	2.92	3.16	OK
WAR RD M11.3	WAR RD M11.2	H		25.643		25.64	2.51	2.406	0.089	11	200	203	DWC	247	180	1.01	OK	0.30	OK	1.41		1.27	1.10	1.14	OK
WAR RD M11.2	WAR RD M11.1	C		20		45.64	2.406	2.354	0.158	15	200	203	DWC	385	180	1.01	OK	0.30	OK	1.27		1.16	1.14	1.19	OK
WAR RD M11.1	WAR RD M11	C		21.87		67.51	2.354	2.302	0.234	18	200	203	DWC	421	180	1.01	OK	0.30	OK	1.16		1.04	1.19	1.26	OK
WAR RD M11	WAR RD M10	J		29.97		5135.70	2.302	2.02	17.771	151	250	253	DWC	106	700	0.60	OK	0.63	OK	-0.86	-0.86	-0.90	3.16	2.92	OK
WAR RD M10	WAR RD M9	C		25		5160.70	2.02	2.32	17.858	151	250	253	DWC	-83	700	0.60	OK	0.63	OK	-0.90		-0.94	2.92	3.26	OK
WAR RD M9	WAR RD M8	C		30		5190.70	2.32	2.325	17.962	152	250	253	DWC	-6000	700	0.60	OK	0.63	OK	-0.94		-0.98	3.26	3.31	OK
WAR RD M8	WAR RD M7	C		30		5220.70	2.325	1.71	18.066	152	250	253	DWC	49	700	0.60	OK	0.63	OK	-0.98		-1.02	3.31	2.73	OK
WAR RD M7	WAR RD M6	C		30		5250.70	1.71	2.272	18.169	153	250	253	DWC	-53	700	0.60	OK	0.63	OK	-1.02		-1.06	2.73	3.33	OK
WAR RD M6	WAR RD M5	C		30		5280.70	2.272	2.189	18.273	153	250	253	DWC	361	700	0.60	OK	0.63	OK	-1.06		-1.10	3.33	3.29	OK
WAR RD M5	WAR RD M4	C		32		5312.70	2.189	2.28	18.384	154	250	253	DWC	-352	700	0.60	OK	0.63	OK	-1.10		-1.15	3.29	3.43	OK
WAR RD M4	WAR RD M3	C		30		5342.70	2.28	2.286	18.488	154	250	253	DWC	-5000	700	0.60	OK	0.63	OK	-1.15		-1.19	3.43	3.48	OK
WAR RD M3	WAR RD M2	C		34.124		5376.83	2.286	2.321	18.606	154	250	253	DWC	-975	700	0.60	OK	0.63	OK	-1.19		-1.24	3.48	3.56	OK
WAR RD M2	WAR RD M1	C		30		5406.83	2.321	2.05	18.710	155	250	253	DWC	111	700	0.60	OK	0.63	OK	-1.24		-1.28	3.56	3.33	OK
WAR RD M1	MAR-MAV RD M6	C		30		5436.83	2.05	2.31	18.813	155	250	253	DWC	-115	700	0.60	OK	0.63	OK	-1.28		-1.32	3.33	3.63	OK
MAV RD M14	MAV RD M13	H		35.944		35.94	2.68	2.445	0.124	13	200	203	DWC	153	152	1.10	OK	0.33	OK	1.58		1.34	1.10	1.11	OK
MAV RD M13	MAV RD M12	C		37.292		73.24	2.445	2.429	0.253	18	200	203	DWC	2331	180	1.01	OK	0.30	OK	1.34		1.13	1.11	1.30	OK
MAV RD M12	MAV RD M11	C		20		93.24	2.429	2.363	0.323	21	200	203	DWC	303	180	1.01	OK	0.30	OK	1.13		1.02	1.30	1.34	OK
MAV RD M11	MAV RD M10	C		19.506		112.74	2.363	2.297	0.390	23	200	203	DWC	296	180	1.01	OK	0.30	OK	1.02		0.91	1.34	1.39	OK
MAV RD M10	MAV RD M9	C		30		142.74	2.29	2.316	0.494	26	200	203	DWC	-1154	320	0.76	OK	0.30	OK	0.91		0.82	1.38	1.50	OK
MAV RD M9	MAV RD M8	C		30		172.74	2.316	2.329	0.598	28	200	203	DWC	-2308	420	0.66	OK	0.30	OK	0.82		0.75	1.50	1.58	OK
MAV RD M8	MAV RD M7	C		30		202.74	2.329	2.332	0.702	30	200	203	DWC	-10000	520	0.60	OK	0.30	OK	0.75		0.69	1.58	1.64	OK
MAV RD M7	MAV RD M6	C		30		232.74	2.332	2.335	0.805	33	200	203	DWC	-10000	520	0.60	OK	0.30	OK	0.69		0.63	1.64	1.71	OK
MAV RD M6	MAV RD M5	C		30		262.74	2.335	2.323	0.909	35	200	203	DWC	2500	520	0.60	OK	0.32	OK	0.63		0.57	1.71	1.75	OK
MAV RD M5	MAV RD M4	C		30		292.74	2.323	2.315	1.013	36	200	203	DWC	3750	520	0.60	OK	0.32	OK	0.57		0.51	1.75	1.81	OK
MAV RD M4	MAV RD M3	C		30		322.74	2.315	2.307	1.117	38	200	203	DWC	3750	520	0.60	OK	0.33							

Man Holes		Man hole Type	MANHOLE TYPE	Length in m	CUMULAT IVE LENGTH IN M	Cumulativ e length in m	Ground Levels		FLOWS LPS	Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope in L	Slope Provided in Pipe 1 in L	As per Manni Veloci ty (V)m/ s	At Ultimate peak flow		Check Veloci ty (> 0.3m/s)	Invert Level in m			Depth of cutting in m		Check Depth of cutting
From	To						Starting Manhole	Ending Manhole			ID	OD					check (d/D< 0.7)	Actual Velocity (v1) m/s		From		To	Starting Manhole	Ending manhol e	
GDN RD M6	GDN RD M7	C		30.031		189.28	2.444	2.478	0.655	29	200	203	DWC	-883	430	0.65	OK	0.30	OK	0.48		0.41	1.96	2.07	OK
GDN RD M7	GDN RD M8	C		30		219.28	2.478	2.427	0.759	32	200	203	DWC	588	520	0.60	OK	0.30	OK	0.41		0.35	2.07	2.08	OK
GDN RD M8	GDN RD M9	C		30		249.28	2.427	2.375	0.863	34	200	203	DWC	577	520	0.60	OK	0.32	OK	0.35		0.29	2.08	2.09	OK
GDN RD M9	GDN RD M10	C		30		279.28	2.37	2.432	0.966	36	200	203	DWC	-484	520	0.60	OK	0.32	OK	0.29		0.23	2.08	2.20	OK
GDN RD M10	GDN-ALK RD M11	C		30		309.28	2.432	2.485	1.070	37	200	203	DWC	-566	520	0.60	OK	0.33	OK	0.23		0.17	2.20	2.32	OK
GDN-ALK RD M11	ALK RD M1	J		27		6530.65	2.485	2.45	22.599	170	250	253	DWC	771	700	0.60	OK	0.65	OK	-1.70	-1.70	-1.74	4.19	4.19	OK
ALK RD M1	ALK-SBC RD M2	C		30		6560.65	2.45	2.281	22.702	171	250	253	DWC	178	700	0.60	OK	0.65	OK	-1.74		-1.78	4.19	4.06	OK
SBC RD M1	SBC RD M2	H		33		33.00	2.48	2.319	0.114	13	200	203	DWC	205	180	1.01	OK	0.30	OK	1.38		1.20	1.10	1.12	OK
SBC RD M2	SBC RD M3	C		30		63.00	2.319	2.327	0.218	17	200	203	DWC	-3750	180	1.01	OK	0.30	OK	1.20		1.03	1.12	1.30	OK
SBC RD M3	SBC RD M4	C		30		93.00	2.327	2.216	0.322	21	200	203	DWC	270	180	1.01	OK	0.30	OK	1.03		0.86	1.30	1.36	OK
SBC RD M4	SBC RD M5	C		15		108.00	2.216	2.198	0.374	22	200	203	DWC	833	180	1.01	OK	0.30	OK	0.86		0.78	1.36	1.42	OK
SBC RD M5	SBC RD M6	C		20		128.00	2.19	2.281	0.443	24	200	203	DWC	-220	180	1.01	OK	0.30	OK	0.78		0.67	1.41	1.61	OK
SBC RD M6	SBC RD M7	C		30		158.00	2.281	2.304	0.547	27	200	203	DWC	-1304	320	0.76	OK	0.30	OK	0.67		0.58	1.61	1.72	OK
SBC RD M7	SBC RD M8	C		30		188.00	2.304	2.369	0.651	29	200	203	DWC	-462	420	0.66	OK	0.30	OK	0.58		0.51	1.72	1.86	OK
SBC RD M8	SBC RD M9	C		30		218.00	2.369	2.307	0.754	31	200	203	DWC	484	520	0.60	OK	0.30	OK	0.51		0.45	1.86	1.86	OK
SBC RD M9	SBC RD M10	C		30		248.00	2.307	2.244	0.858	34	200	203	DWC	476	520	0.60	OK	0.32	OK	0.45		0.39	1.86	1.85	OK
SBC RD M10	ALK-SBC RD M2	C		26		274.00	2.244	2.281	0.948	35	200	203	DWC	-703	520	0.60	OK	0.32	OK	0.39		0.34	1.85	1.94	OK
ALK-SBC RD M2	To Muttathil Well	J	L	40		6874.65	2.281	2.369	23.789	175	250	253	DWC	-455	700	0.60	OK	0.66	OK	-1.78	-1.78	-1.84	4.06	4.21	OK

SEWER NETWORK DESIGN - Zone 6 (TP S/Catchment) BLOCK 10 (To Padiyath Well of KWA)

Sl. No.	Description	Year	Quantity BLOCK5	Unit
1	Projected population	2055	1418	Persons
2	Domestic Demand @150LPCD		0.213	MLD
3	Floating population		780	Persons
4	Floating Demand @ 70 LPCD		0.055	MLD
5	Nondomestic demand		0.033	MLD
6	Waste water generated		85%	%
7	Quantity of waste water generated		0.255	MLD
8			255132.149	LPD
9	GWl @4500liters per kilometer sewer length		5206.248848	Liters

260338.398

0.005206249 MLD

0.260 MLD

0.260

SEWER NETWORK DESIGN - CHILAVANNOOR CANAL_SOUTH CATCHMENT_ZONE 6_BLOCK 10																																									
Sl. No.	Man Holes				Manhole	MANHOLE	Length in m	CUMULAT IVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Proposed Size of Sewer in			As per Manning Table			At Ultimate peak flow					Check Velocity (> n 3m/s)	Fall m	Manhole Drop m	Invert Level in m		Depth of cutting in m		Check Depth of cutting					
	From	To			Type	TYPE				Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow	Requi red dia.	ID	OD	MOC	Groun d Slope 1 in L	Slope Provided in Pipe 1 in L	Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharg e Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0. 7)	Actual Velocity (v1) m/s			From	To	Starting Manhole	Ending manhole				
1	4	5	6	7	8	9	10.00	11	12	13.000	14.000	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	
1	SV RD M5	SV RD M6	0	1	H		18		18.00	1.36	1.33	1.77	1.77	2.25	0.046	0.000	0.046	8	200	203	DWC	600	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	0.26		0.16	1.10	1.17	OK	
2	SV RD M6	SV RD M7	1	1	C		20		38.00	1.33	1.25	1.96	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	260	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.16		0.05	1.17	1.20	OK	
3	SV RD M7	SV RD M8	1	1	C		30		68.00	1.25	1.29	2.95	6.68	2.25	0.174	0.000	0.174	15	200	203	DWC	-750	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.05		-0.12	1.20	1.41	OK	
4	SV RD M8	SV RD M9	1	1	C		30		98.00	1.29	1.28	2.95	9.63	2.25	0.251	0.000	0.251	18	200	203	DWC	3000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.12		-0.29	1.41	1.57	OK	
5	SV RD M9	SV RD M10	1	1	C		30		128.00	1.28	1.40	2.95	12.57	2.25	0.327	0.000	0.327	21	200	203	DWC	-250	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.29		-0.46	1.57	1.86	OK	
6	SV RD M10	SV RD M11	1	1	C		30		158.00	1.40	1.48	2.95	15.52	2.25	0.404	0.000	0.404	23	200	203	DWC	-375	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.46		-0.63	1.86	2.11	OK	
7	SV RD M11	SV RD M12	1	1	C		30		188.00	1.48	1.40	2.95	18.47	2.25	0.481	0.000	0.481	25	200	203	DWC	375	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	-0.63		-0.72	2.11	2.12	OK	
8	SV RD M12	SV RD M13	1	1	C		30		218.00	1.40	1.26	2.95	21.42	2.25	0.558	0.000	0.558	27	200	203	DWC	204	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	-0.72		-0.79	2.12	2.05	OK	
9	SV RD M13	SV RD M14	1	1	C		30		248.00	1.26	1.11	2.95	24.36	2.25	0.634	0.000	0.634	29	200	203	DWC	204	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	-0.79		-0.86	2.05	1.97	OK	
10	SV RD M14	SV RD M15	1	1	C		31		279.00	1.11	1.03	3.05	27.41	2.25	0.714	0.000	0.714	31	200	203	DWC	388	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	-0.86		-0.93	1.97	1.96	OK	
11	SV RD M15	SV-MG RD M16	1	1	C		30		309.00	1.03	1.06	2.95	30.36	2.25	0.790	0.000	0.790	32	200	203	DWC	-1000	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	-0.93		-0.99	1.96	2.05	OK	
12	MON RD M7	MON RD M8	0	1	H		15.603		15.60	1.25	1.18	1.53	1.53	2.25	0.040	0.000	0.040	8	200	203	DWC	223	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	0.15		0.06	1.10	1.12	OK	
13	MON RD M8	MON RD M9	1	1	C		15		30.60	1.18	1.16	1.47	3.01	2.25	0.078	0.000	0.078	10	200	203	DWC	750	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.06		-0.02	1.12	1.18	OK	
14	MON RD M9	MG-MON RD M4	1	1	C		32		62.60	1.16	1.28	3.14	6.15	2.25	0.160	0.000	0.160	15	200	203	DWC	-267	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	-0.02		-0.20	1.18	1.48	OK	
15	MON RD M11.2	MON RD M11.1	0	1	H		22.038		22.04	1.68	1.63	2.16	2.16	2.25	0.056	0.000	0.056	9	200	203	DWC	441	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	0.58		0.46	1.10	1.17	OK	
16	MON RD M11.1	MON RD M11	1	1	C		30		52.04	1.63	1.58	2.95	5.11	2.25	0.133	0.000	0.133	14	200	203	DWC	600	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.46		0.29	1.17	1.29	OK	
17	MON RD M12	MON RD M11	0	1	H		30		30.00	1.02	1.58	2.95	2.95	2.25	0.077	0.000	0.077	10	200	203	DWC	-54	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.08		-0.25	1.10	1.83	OK	
18	MON RD M11	MON RD M10	2	1	J		22		104.04	1.58	1.08	2.16	10.22	2.25	0.266	0.000	0.266	19	200	203	DWC	44	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	-0.25	-0.25	-0.37	1.83	1.45	OK	
19	MON RD M10	MG-MON RD M4	1	1	C		20		124.04	1.08	1.26	1.96	12.19	2.25	0.317	0.000	0.317	21	200	203	DWC	-112	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	-0.37		-0.48	1.45	1.74	OK	
20	MG-MON RD M4	MG RD M3	2	1	J		30		216.64	1.26	1.36	2.95	21.28	2.25	0.554	0.000	0.554	27	200	203	DWC	-300	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	-0.48	-0.48	-0.55	1.74	1.91	OK	
21	MG RD M3	MG RD M2	1	1	C		30		246.64	1.36	1.23	2.95	24.23	2.25	0.631	0.000	0.631	29	200	203	DWC																				

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Requird dia.	Proposed Size of Sewer in			MOC	Groun d Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m		Depth of cutting in m		Check Depth of cutting	
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW1+UAC	Total Flow		ID	OD	Manning s n				Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From	To	Starting Manhole	Ending manhole		
75	CS RD M3.4	CS RD M3.3	1	1	C		30		58.00	2.42	2.33	2.95	5.70	2.25	0.148	0.000	0.148	14	200	203	DWC	337	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.32		1.15	1.10	1.18	OK
76	CS RD M3.3	CS RD M3	1	1	C		30		88.00	2.33	1.80	2.95	8.64	2.25	0.225	0.000	0.225	17	200	203	DWC	57	65	0.010	1.68	52.99	0.00	0.30	0.07	OK	0.51	OK	0.46	0.00	1.15		0.69	1.18	1.11	OK
77	CS RD M3	CS RD M4	3	1	J		25.999		223.00	1.80	1.19	2.55	21.91	2.25	0.570	0.000	0.570	27	200	203	DWC	42	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	-0.32	-0.32	-0.38	2.12	1.57	OK
78	CS RD M4	CS RD M5	1	1	C		30		253.00	1.19	1.14	2.95	24.85	2.25	0.647	0.000	0.647	29	200	203	DWC	612	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	-0.38		-0.45	1.57	1.59	OK
79	CS RD M5	CS RD M6	1	1	C		30		283.00	1.14	1.21	2.95	27.80	2.25	0.724	0.000	0.724	31	200	203	DWC	-390	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	-0.45		-0.51	1.59	1.72	OK
80	CS RD M6	CS RD M7	1	1	C		30		313.00	1.21	3.19	2.95	30.75	2.25	0.801	0.000	0.801	32	200	203	DWC	-15	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	-0.51		-0.57	1.72	3.76	OK
81	CS RD M7	CS RD M8	1	1	C		30		343.00	3.19	1.16	2.95	33.70	2.25	0.877	0.000	0.877	34	200	203	DWC	15	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	-0.57		-0.63	3.76	1.79	OK
82	CS RD M8	SRS-CS RD M3	1	1	C		30		373.00	1.16	1.38	2.95	36.64	2.25	0.954	0.000	0.954	35	200	203	DWC	-139	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	-0.63		-0.69	1.79	2.07	OK
83	SRS RD M1	SRS RD M2	0	1	H		30		30.00	1.47	1.25	2.95	2.95	2.25	0.077	0.000	0.077	10	200	203	DWC	138	138	0.010	1.16	36.37	0.00	0.30	0.07	OK	0.35	OK	0.22	0.00	0.37		0.15	1.10	1.10	OK
84	SRS RD M2	SRS-CS RD M3	1	1	C		26		56.00	1.25	1.38	2.55	5.50	2.25	0.143	0.000	0.143	14	200	203	DWC	-213	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.15		0.01	1.10	1.37	OK
85	SRS-CS RD M3	KU RD M1	2	1	J		25		454.00	1.38	1.38	2.46	44.60	2.25	1.161	0.000	1.161	39	200	203	DWC	0	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.05	0.00	-0.69	-0.69	-0.74	2.07	2.12	OK
86	KU RD M1	KU RD M2	1	1	C		30		484.00	1.38	1.61	2.95	47.55	2.25	1.238	0.000	1.238	40	200	203	DWC	-130	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	-0.74		-0.80	2.12	2.41	OK
87	KU RD M2.2	KU RD M2.1	0	1	H		20		20.00	1.97	1.79	1.96	1.96	2.25	0.051	0.000	0.051	9	200	203	DWC	109	108	0.010	1.31	41.11	0.00	0.30	0.07	OK	0.39	OK	0.19	0.00	0.87		0.68	1.10	1.11	OK
88	KU RD M2.1	KU RD M2	1	1	C		30		50.00	1.79	1.61	2.95	4.91	2.25	0.128	0.000	0.128	13	200	203	DWC	164	164	0.010	1.06	33.36	0.00	0.30	0.07	OK	0.32	OK	0.18	0.00	0.68		0.50	1.11	1.11	OK
89	KU RD M2	KU RD M3	2	1	J		30		564.00	1.61	1.47	2.95	55.41	2.25	1.443	0.000	1.443	43	200	203	DWC	227	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	-0.80	-0.80	-0.86	2.41	2.33	OK
90	KU RD M3	KU RD M4	1	1	C		30		594.00	1.47	1.36	2.95	58.35	2.25	1.520	0.000	1.520	44	200	203	DWC	259	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	-0.86		-0.92	2.33	2.28	OK
91	KU RD M4	KU RD M5	1	1	C		30		624.00	1.36	1.50	2.95	61.30	2.25	1.596	0.000	1.596	46	200	203	DWC	-213	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	-0.92		-0.98	2.28	2.48	OK
92	KU RD M5	KU RD M6	1	1	C		13		637.00	1.50	1.66	1.28	62.58	2.25	1.630	0.000	1.630	46	200	203	DWC	-81	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.03	0.00	-0.98		-1.01	2.48	2.67	OK
93	KU RD M6	KU RD M7	1	1	C		28		665.00	1.66	1.60	2.75	65.33	2.25	1.701	0.000	1.701	47	200	203	DWC	509	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.05	0.00	-1.01		-1.06	2.67	2.66	OK
94	KU RD M7	KU RD M8	1	1	C		30		695.00	1.60	1.55	2.95	68.27	2.25	1.778	0.000	1.778	48	200	203	DWC	600	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	-1.06		-1.12	2.66	2.67	OK
95	KU RD M8	KU RD M9	1	1	C		20		715.00	1.55	1.66	1.96	70.24	2.25	1.829	0.000	1.829	49	200	203	DWC	-190	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.04	0.00	-1.12		-1.16	2.67	2.82	OK
96	KU RD M9	WC RD M5	1	1	C		20		735.00	1.66	1.40	1.96	72.20	2.25	1.880	0.000	1.880	49	200	203	DWC	77	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.04	0.00	-1.16		-1.20	2.82	2.60	OK
97	WC RD M5	WC RD M6	2	1	J		19.281		2590.11	1.45	2.02	1.89	254.44	2.25	6.626	0.000	6.626	92	200	203	DWC	-34	520	0.010	0.60	18.73	0.35	0.92	0.41	OK	0.55	OK	0.04	0.00	-2.46	-2.46	-2.50	3.91	4.52	OK
98	WC RD M6	WC RD M7	1	1	C		30		2620.11	2.02	1.63	2.95	257.39	2.25	6.703	0.000	6.703	93	200	203	DWC	77	520	0.010	0.60	18.73	0.36	0.92	0.42	OK	0.55	OK	0.06	0.00	-2.50		-2.56	4.52	4.19	OK
99	WC RD M7	WC RD M8	1	1	C		20		2640.11	1.63	1.24	1.96	259.36	2.25	6.754	0.000	6.754	93	200	203	DWC	51	520	0.010	0.60	18.73	0.36	0.92	0.42	OK	0.55	OK	0.04	0.00	-2.56		-2.60	4.19	3.84	OK
100	WC RD M8	To Padiyath well	1	0	C	L	10		2650.11	1.24	1.36	0.98	260.34	2.25	6.780	0.000	6.780	93	200	203	DWC	-85	520	0.010	0.60	18.73	0.36	0.92	0.42	OK	0.55	OK	0.02	0.00	-2.60		-2.62	3.84	3.98	OK

2650.11

SEWER NETWORK DESIGN -BLOCK 11-ELAMKULAM																																										
Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm.	MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m		Depth of cutting in m		Check Depth of cutting					
	From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow						Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s			Check Velocity (> 0.3m/s)	From	To	Starting Manhole		Ending manhole				
1	4	5	6	7	8	9	10.00	11	12	13.000	14.000	15	16	17	18	19	20	21	22	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43			
1	KBN RD M9.3	KBN RD M9.2	0	1	H		35.435		35.44	1.34	1.61	5.98	5.98	2.25	0.156	0.000	0.156	15	200	DWC	-133	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.20	0.00	0.24		0.04	1.10	1.57	OK			
2	KBN RD M9.2	KBN RD M9.1	1	1	C		18.876		54.31	1.61	1.86	3.18	9.16	2.25	0.239	0.000	0.239	18	200	DWC	-75	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	0.04		-0.06	1.57	1.92	OK			
3	KBN RD M9.1	KBN RD M9	1	1	C		18.602		72.91	1.86	1.07	3.14	12.30	2.25	0.320	0.000	0.320	21	200	DWC	24	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	-0.06		-0.16	1.92	1.23	OK			
4	KBN RD M9	KBN RD M10	1	1	C		30.083		103.00	1.07	1.50	5.07	17.37	2.25	0.452	0.000	0.452	25	200	DWC	-71	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.16		-0.33	1.23	1.83	OK			
5	KBN RD M10	KBN RD M11A	1	1	C		20.248		123.24	1.50	1.66	3.41	20.79	2.25	0.541	0.000	0.541	27	200	DWC	-122	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	-0.33		-0.39	1.83	2.05	OK			
6	KBN RD M11A	KBN RD M11	1	1	C		16.5		139.74	1.66	1.58	2.78	23.57	2.25	0.614	0.000	0.614	28	200	DWC	204	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	-0.39		-0.43	2.05	2.01	OK			
7	KBN RD M11	KBN RD M12	1	1	C		25		164.74	1.58	1.38	4.22	27.78	2.25	0.724	0.000	0.724	31	200	DWC	125	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	-0.43		-0.49	2.01	1.87	OK			
8	KBN RD M12	KBN RD M13	1	1	C		38.909		203.65	1.38	1.33	6.56	34.35	2.25	0.894	0.000	0.894	34	200	DWC	778	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.07	0.00	-0.49		-0.56	1.87	1.89	OK			
9	KBN RD M13	KBN-VKS RD M1	1	1	C		30		233.65	1.33	1.05	5.06	39.41	2.25	1.026	0.000	1.026	37	200	DWC	105	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	-0.56		-0.62	1.89	1.67	OK			
10	VKS RD M4	VKS RD M3	0	1	H		30		30.00	2.01	1.73	5.06	5.06	2.25	0.132	0.000	0.132	13	200	DWC	106	106	0.010	1.32	41.50	0.00	0.30	0.07	OK	0.40	OK	0.28	0.00	0.91		0.63	1.10	1.10	OK			
11	VKS RD M3	VKS RD M2	1	1	C		30		60.00	1.73	1.34	5.06	10.12	2.25	0.264	0.000	0.264	19	200	DWC	77	77	0.010	1.55	48.69	0.01	0.30	0.07	OK	0.46	OK	0.39	0.00	0.63		0.24	1.10	1.11	OK			
12	VKS RD M2	KBN-VKS RD M1	1	1	C		30		90.00	1.34	1.05	5.06	15.18	2.25	0.395	0.000	0.395	23	200	DWC	101	101	0.010	1.35	42.51	0.01	0.30	0.07	OK	0.41	OK	0.30	0.00	0.24		-0.06	1.10	1.10	OK			
13	KBN-VKS RD M1	VKS-ARG RD M1	2	1	J		20.633		344.29	1.05	1.58	3.48	58.06	2.25	1.512	0.000	1.512	44	200	DWC	-38	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.04	0.00	-0.62	-0.62	-0.66	1.67	2.24	OK			
14	VKS-ARG RD M1	ARG RD M2	1	1	C		30		374.29	1.58	1.37	5.06	63.12	2.25	1.644	0.000	1.644	46	200	DWC	145	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	-0.66		-0.72	2.24	2.09	OK			
15	ARG RD M2	ARG RD M3	1	1	C		30		404.29	1.37	1.27	5.06	68.18	2.25	1.776	0.000	1.776	48	200	DWC	300	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	-0.72		-0.78	2.09	2.05	OK			
16	ARG RD M3	ARG RD M4	1	1	C		30		434.29	1.27	1.61	5.06	73.24	2.25	1.907	0.000	1.907	50	200	DWC	-89	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	-0.78		-0.84	2.05	2.45	OK			
17	ARG RD M4	ARG RD M5	1	1	C		20.6		454.89	1.61	1.72	3.47	76.72	2.25	1.998	0.000	1.998	51	200	DWC	-200	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.04	0.00	-0.84		-0.88	2.45	2.60	OK			
18	ARG RD M5	ARG RD M6	1	1	C		20		474.89	1.72	1.05	3.37	80.09	2.25	2.086	0.000	2.086	52	200	DWC	30	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.04	0.00	-0.88		-0.92	2.60	1.97	OK			
19	ARG RD M6.3	ARG RD M6.2	0	1	H		21.139		21.14	1.15	1.19	3.57	3.57	2.25	0.093	0.000	0.093	11	200	DWC	-571	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	0.05		-0.07	1.10	1.26	OK			
20	ARG RD M6.2	ARG RD M6.1	1	1	C		30.002		51.14	1.19	1.12	5.06	8.62	2.25	0.225	0.000	0.225	17	200	DWC	448	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.07		-0.24	1.26	1.36	OK			
21	ARG RD M6.1	ARG RD M6	1	1	C		30		81.14	1.12	1.05	5.06	13.68	2.25	0.356	0.000	0.356	22	200	DWC	441	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.24		-0.41	1.36	1.46	OK			
22	ARG RD M6	ARG-CR RD M7	2	1	J		7.831		563.86	1.05	1.51	1.32	95.09	2.25	2.476	0.000	2.476	57	200	DWC	-17	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.02	0.00	-0.92	-0.92	-0.94	1.97	2.45	OK			
23	ARGCR RD M7.4	ARGCR RD M7.3	0	1	H		30		30.00	1.98	1.94	5.06	5.06	2.25	0.132	0.000	0.132	13	200	DWC	667	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.88		0.71	1.10	1.23	OK			
24	ARGCR RD M7.3	ARGCR RD M7.2	1	1	C		30		60.00	1.94	1.89	5.06	10.12</																													

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm	MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
										Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow						Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)	From	To			Starting Manhole	Ending manhole				
61	MUH RD M4	MUH RD M3	0	1	H		30	30.00	2.87	2.78	5.06	5.06	2.25	0.132	0.000	0.132	13	200	DWC	330	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.77		1.60	1.10	1.18	OK
62	MUH RD M3	MUH RD M2	1	1	C		30	60.00	2.78	2.52	5.06	10.12	2.25	0.264	0.000	0.264	19	200	DWC	112	160	0.010	1.07	33.77	0.01	0.30	0.07	OK	0.32	OK	0.19	0.00	1.60		1.41	1.18	1.11	OK
63	MUH RD M2	MUH RD M1	1	1	C		30	90.00	2.52	1.66	5.06	15.18	2.25	0.395	0.000	0.395	23	200	DWC	35	35	0.010	2.29	72.21	0.01	0.30	0.07	OK	0.69	OK	0.86	0.00	1.41		0.55	1.11	1.11	OK
64	MUH RD M1	CPU-MUH RD M12	1	1	C		30	120.00	1.66	1.35	5.06	20.24	2.25	0.527	0.000	0.527	26	200	DWC	95	97	0.010	1.38	43.38	0.01	0.30	0.07	OK	0.41	OK	0.31	0.00	0.55		0.24	1.11	1.11	OK
65	CPU-MUH RD M12	CPU RD M11	2	1	J		28.54	3744.11	1.35	1.86	4.81	631.44	2.25	16.444	0.000	16.444	145	200	DWC	-55	700	0.010	0.51	16.15	1.02	1.14	0.82	Check	0.58	OK	0.04	0.00	-2.03	-2.03	-2.07	3.38	3.93	OK
66	CPU RD M11	CPU RD M10	1	1	C		25	3769.11	1.86	1.47	4.22	635.66	2.25	16.554	0.000	16.554	146	200	DWC	65	700	0.010	0.51	16.15	1.03	1.14	0.82	Check	0.58	OK	0.04	0.00	-2.07		-2.11	3.93	3.58	OK
67	CPU RD M10	CPU RD M9	1	1	C		26.564	3795.68	1.47	2.36	4.48	640.14	2.25	16.670	0.000	16.670	146	200	DWC	-30	700	0.010	0.51	16.15	1.03	1.14	0.82	Check	0.58	OK	0.04	0.00	-2.11		-2.15	3.58	4.51	OK
68	CPU RD M9.9	CPU RD M9.8	0	1	H		30	30.00	1.04	1.20	5.06	5.06	2.25	0.132	0.000	0.132	13	200	DWC	-188	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.06		-0.23	1.10	1.43	OK
69	CPU RD M9.8	CPU RD M9.7	1	1	C		30	60.00	1.20	1.65	5.06	10.12	2.25	0.264	0.000	0.264	19	200	DWC	-67	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.23		-0.40	1.43	2.05	OK
70	CPU RD M9.7	CPU RD M9.6	1	1	C		17.651	77.65	1.65	2.24	2.98	13.10	2.25	0.341	0.000	0.341	21	200	DWC	-30	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	-0.40		-0.50	2.05	2.74	OK
71	CPU RD M9.6	CPU RD M9.5	1	1	C		30	107.65	2.24	2.84	5.06	18.16	2.25	0.473	0.000	0.473	25	200	DWC	-50	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.50		-0.67	2.74	3.51	OK
72	CPU RD M9.5	CPU RD M9.4	1	1	C		30	137.65	2.84	1.92	5.06	23.21	2.25	0.605	0.000	0.605	28	200	DWC	33	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	-0.67		-0.74	3.51	2.66	OK
73	CPU RD M9.4	CPU RD M9.3	1	1	C		30	167.65	1.92	1.01	5.06	28.27	2.25	0.736	0.000	0.736	31	200	DWC	33	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	-0.74		-0.80	2.66	1.81	OK
74	CPU RD M9.3	CPU RD M9.2	1	1	C		30	197.65	1.01	1.63	5.06	33.33	2.25	0.868	0.000	0.868	34	200	DWC	-48	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	-0.80		-0.86	1.81	2.49	OK
75	CPU RD M9.2	CPU RD M9.1	1	1	C		30	227.65	1.63	0.99	5.06	38.39	2.25	1.000	0.000	1.000	36	200	DWC	47	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	-0.86		-0.92	2.49	1.91	OK
76	CPU RD M9.1	CPU RD M9	1	1	C		30	257.65	0.99	2.36	5.06	43.45	2.25	1.132	0.000	1.132	38	200	DWC	-22	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	-0.92		-0.98	1.91	3.34	OK
77	CPU RD M9	CPU RD M8	2	1	J		30	4083.33	2.36	2.41	5.06	688.65	2.25	17.934	0.000	17.934	152	250	DWC	-566	700	0.010	0.60	29.28	0.61	1.05	0.57	OK	0.63	OK	0.04	0.00	-2.15	-2.15	-2.19	4.51	4.60	OK
78	CPU RD M8	CPU RD M7	1	1	C		30	4113.33	2.41	1.81	5.06	693.71	2.25	18.065	0.000	18.065	152	250	DWC	50	700	0.010	0.60	29.28	0.62	1.05	0.57	OK	0.63	OK	0.04	0.00	-2.19		-2.23	4.60	4.04	OK
79	CPU RD M7	CPU RD M6	1	1	C		16.404	4129.73	1.81	1.17	2.77	696.48	2.25	18.137	0.000	18.137	153	250	DWC	25	700	0.010	0.60	29.28	0.62	1.05	0.57	OK	0.63	OK	0.02	0.00	-2.23		-2.25	4.04	3.42	OK
80	CPU RD M6	CPU RD M5	1	1	C		30	4159.73	1.17	2.86	5.06	701.54	2.25	18.269	0.000	18.269	153	250	DWC	-18	700	0.010	0.60	29.28	0.62	1.05	0.57	OK	0.63	OK	0.04	0.00	-2.25		-2.29	3.42	5.15	OK
81	CPU RD M1.3	CPU RD M1.2	0	1	H		25	25.00	2.06	1.43	4.22	4.22	2.25	0.110	0.000	0.110	12	150	DWC	39	40	0.010	1.77	31.37	0.00	0.30	0.07	OK	0.53	OK	0.63	0.00	0.96		0.33	1.10	1.10	OK
82	CPU RD M1.2	CPU RD M1.1	1	1	C		34	59.00	1.43	2.05	5.73	9.95	2.25	0.259	0.000	0.259	19	150	DWC	-55	180	0.010	0.84	14.79	0.02	0.40	0.10	OK	0.33	OK	0.19	0.00	0.33		0.14	1.10	1.91	OK
83	CPU RD M1.6	CPU RD M1.5	0	1	H		24	24.00	1.48	1.63	4.05	4.05	2.25	0.105	0.000	0.105	12	150	DWC	-164	180	0.010	0.84	14.79	0.01	0.30	0.07	OK	0.25	Check	0.13	0.00	0.38		0.25	1.10	1.38	OK
84	CPU RD M1.5	CPU RD M1.4	1	1	C		13	37.00	1.63	1.77	2.19	6.24	2.25	0.163	0.000	0.163	15	150	DWC	-93	180	0.010	0.84	14.79	0.01	0.30	0.07	OK	0.25	Check	0.07	0.00	0.25		0.18	1.38	1.59	OK
85	CPU RD M1.4	CPU RD M1.1	1	1	C		26	63.00	1.77	2.05	4.38	10.62	2.25	0.277	0.000	0.277	19	150	DWC	-93	180	0.010	0.84	14.79														

ELANKULAM-BLOCK 12 A																																										
Sl. No.	Road	Element	Man Holes				Manh ole Type	MANHOL E TYPE	Length in m	CUMULAT IVE LENGTH IN M	Cumulati ve length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow							Fall m	Manhole Drop m	Invert Level in m		Depth of cutting in m		Check Depth of cutting
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharg e Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0. 75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)				From	To	Starting Manhole	Ending manhol e	
1	2	3	4	5	6	7	8	9	10.00	11	12	13.000	14.000	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
2			KK RD M50	KK RD M51	0	1	H		38.43		38.43	3.263	2.856	4.35	4.35	2.25	0.113	0.000	0.113	13	200	203	DWC	94	94	0.010	1.40	44.06	0.00	0.30	0.07	OK	0.42	OK	0.41	0.00	2.16		1.75	1.10	1.11	OK
3			KK RD M51	KK RD M52	1	1	C		30.07		68.51	2.856	3.168	3.40	7.75	2.25	0.202	0.000	0.202	17	200	203	DWC	-96	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.75		1.58	1.11	1.59	OK
4			KK RD M52	KK RD M53	1	1	C		29.83		98.33	3.168	2.954	3.37	11.12	2.25	0.290	0.000	0.290	20	200	203	DWC	139	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.58		1.41	1.59	1.54	OK
5			KK RD M53	KK RD M54	1	1	C		30.00		128.33	2.954	3.095	3.39	14.51	2.25	0.378	0.000	0.378	22	200	203	DWC	-213	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.41		1.24	1.54	1.86	OK
6			KK RD M54	KK RD M55	1	1	C		30.00		158.33	3.095	2.965	3.39	17.91	2.25	0.466	0.000	0.466	25	200	203	DWC	231	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.24		1.07	1.86	1.90	OK
7			KK RD M55	KK RD M56	1	1	C		30.03		188.36	2.965	2.798	3.40	21.30	2.25	0.555	0.000	0.555	27	200	203	DWC	180	432	0.010	0.65	20.55	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	1.07		1.00	1.90	1.80	OK
8			KK RD M56	KK RDR M56	1	1	C		11.28		199.64	2.798	2.869	1.28	22.58	2.25	0.588	0.000	0.588	28	200	203	DWC	-159	432	0.010	0.65	20.55	0.03	0.46	0.13	OK	0.30	OK	0.03	0.00	1.00		0.97	1.80	1.90	OK
9			KK RDR M59L	KK RDR M58	0	1	H		29.36		29.36	2.301	2.309	3.32	3.32	2.25	0.086	0.000	0.086	11	200	203	DWC	-3670	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	1.20		1.04	1.10	1.27	OK
10			KK RDR M58	KK RDR M57	1	1	C		26.73		56.09	2.309	2.489	3.02	6.34	2.25	0.165	0.000	0.165	15	200	203	DWC	-148	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.15	0.00	1.04		0.89	1.27	1.60	OK
11			KK RDR M57	KK RDR M56	1	1	C		29.44		85.53	2.489	2.798	3.33	9.67	2.25	0.252	0.000	0.252	18	200	203	DWC	-95	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	0.89		0.73	1.60	2.07	OK
12			KK RDR M56	KK RDR M55	2	1	J		28.29		313.46	2.869	2.742	3.20	35.45	2.25	0.923	0.000	0.923	35	200	203	DWC	223	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	0.73	0.73	0.68	2.14	2.06	OK
13			KK RDR M55	KK RDR M54	1	1	C		30.00		343.46	2.742	2.853	3.39	38.85	2.25	1.012	0.000	1.012	36	200	203	DWC	-270	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	0.68		0.62	2.06	2.23	OK
14			KK RDR M54	KK RDR M53	1	1	C		30.00		373.46	2.853	2.922	3.39	42.24	2.25	1.100	0.000	1.100	38	200	203	DWC	-435	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	0.62		0.56	2.23	2.36	OK
15			KK RDR M53	KK RDR M52	1	1	C		29.99		403.46	2.922	3.168	3.39	45.63	2.25	1.188	0.000	1.188	39	200	203	DWC	-122	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	0.56		0.50	2.36	2.67	OK
16			KK RDR M52	KK RDR M51	1	1	C		30.00		433.46	3.168	3.021	3.39	49.02	2.25	1.277	0.000	1.277	41	200	203	DWC	204	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	0.50		0.44	2.67	2.58	OK
17			KK RDR M51	TH-PY RD M1	1	1	C		21.19		454.65	3.021	2.386	2.40	51.42	2.25	1.339	0.000	1.339	42	200	203	DWC	33	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.04	0.00	0.44		0.40	2.58	1.99	OK
18			TH-PY RD M1	TH-PY RD M2	1	1	C		30.00		484.65	2.386	2.018	3.39	54.81	2.25	1.427	0.000	1.427	43	200	203	DWC	82	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	0.40		0.34	1.99	1.68	OK
19			TH-PY RD M2	TH-PY RD M3	1	1	C		30.00		514.65	2.018	2.020	3.39	58.21	2.25	1.516	0.000	1.516	44	200	203	DWC	-15000	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	0.34		0.28	1.68	1.74	OK
20			TH-PY RD M3	TH-PY RD M4	1	1	C		30.00		544.65	2.020	2.031	3.39	61.60	2.25	1.604	0.000	1.604	46	200	203	DWC	-2727	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	0.28		0.22	1.74	1.81	OK
21			TH-PY RD M4	TH-PY RD M5	1	1	C		30.00		574.65	2.031	2.619	3.39	64.99	2.25	1.693	0.000	1.693	47	200	203	DWC	-51	520	0.010	0.60	18.73	0.09</													

Sl. No.	Road	Element	Man Holes										FLOWS LPS					Proposed Size of Sewer in mm					As per Manning Table			At Ultimate peak flow								Invert Level in m			Depth of cutting in m		Check Depth of cutting		
			From	To			Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day	Peak Factor	Cum Peak Factor	GW+UAC	Total Flow	Required dia.	ID	OD	MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (>0.3m/s)	Fall m	Manhole Drop m	From	To	Starting Manhole	Ending manhole	
66			RO L M2.2	RO L M2.1	1	1	C		30.00	49.00	1.976	2.030	3.39	5.54	2.25	0.144	0.000	0.144	14	200	203	DWC	-556	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.71		0.54	1.27	1.49	OK
67			RO L M2.1	RO L M2	1	1	C		30.00	79.00	2.030	1.904	3.39	8.94	2.25	0.233	0.000	0.233	18	200	203	DWC	238	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.54		0.37	1.49	1.53	OK
68			RO L M2	RO L M1	2	1	J		27.00	223.58	1.904	1.894	3.05	25.29	2.25	0.659	0.000	0.659	29	200	203	DWC	2700	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	-0.07	-0.07	-0.13	1.97	2.02	OK
69			RO L M1	TH-PY RD M6.3	1	1	C		20.00	243.58	1.894	1.882	2.26	27.55	2.25	0.717	0.000	0.717	31	200	203	DWC	1667	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	-0.13		-0.18	2.02	2.06	OK
70			TH-PY RD M6.6	TH-PY RD M6.5	0	1	H		18.14	18.14	1.552	1.721	2.05	2.05	2.25	0.053	0.000	0.053	9	200	203	DWC	-107	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	0.45		0.35	1.10	1.37	OK
71			TH-PY RD M6.5	TH-PY RD M6.4	1	1	C		20.00	38.14	1.721	2.045	2.26	4.31	2.25	0.112	0.000	0.112	12	200	203	DWC	-62	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.35		0.24	1.37	1.81	OK
72			TH-PY RD M6.4.3	TH-PY RD M6.4.2	0	1	H		17.00	17.00	2.080	2.137	1.92	1.92	2.25	0.050	0.000	0.050	8	200	203	DWC	-298	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	0.98		0.89	1.10	1.25	OK
73			TH-PY RD M6.4.2	TH-PY RD M6.4.1	1	1	C		30.00	47.00	2.137	2.263	3.39	5.32	2.25	0.138	0.000	0.138	14	200	203	DWC	-238	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.89		0.72	1.25	1.54	OK
74			TH-PY RD M6.4.1	TH-PY RD M6.4	1	1	C		30.00	77.00	2.263	2.045	3.39	8.71	2.25	0.227	0.000	0.227	17	200	203	DWC	138	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.72		0.55	1.54	1.50	OK
75			TH-PY RD M6.4	TH-PY RD M6.3	2	1	J		21.00	136.14	2.045	1.882	2.38	15.40	2.25	0.401	0.000	0.401	23	200	203	DWC	129	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	0.24	0.24	0.12	1.81	1.76	OK
76			TH-PY RD M6.3	TH-PY RD M6.2	2	1	J		28.00	407.72	1.882	1.874	3.17	46.11	2.25	1.201	0.000	1.201	40	200	203	DWC	3500	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.05	0.00	-0.18	-0.18	-0.23	2.06	2.10	OK
77			TH-PY RD M6.2	TH-PY RD M6.1	1	1	C		30.00	437.72	1.874	1.870	3.39	49.51	2.25	1.289	0.000	1.289	41	200	203	DWC	7500	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	-0.23		-0.29	2.10	2.16	OK
78			TH-PY RD M6.1	TH-PY RD M6	1	1	C		30.00	467.72	1.870	2.041	3.39	52.90	2.25	1.378	0.000	1.378	42	200	203	DWC	-175	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	-0.29		-0.25	2.16	2.39	OK
79			TH-PY RD M6	TH-PY RD M7	2	1	J		30.00	1954.14	2.041	2.075	3.39	221.02	2.25	5.756	0.000	5.756	86	200	203	DWC	-882	520	0.010	0.60	18.73	0.31	0.88	0.39	OK	0.52	OK	0.06	0.00	-0.35	-0.35	-0.41	2.39	2.49	OK
80			TH-PY RD M7	TH-PY RD M8	1	1	C		30.00	1984.14	2.075	2.005	3.39	224.41	2.25	5.844	0.000	5.844	87	200	203	DWC	429	520	0.010	0.60	18.73	0.31	0.88	0.39	OK	0.52	OK	0.06	0.00	-0.41		-0.47	2.49	2.48	OK
81			TH-PY RD M8	TH-PY RD M9	1	1	C		30.00	2014.14	2.005	1.936	3.39	227.80	2.25	5.932	0.000	5.932	87	200	203	DWC	435	520	0.010	0.60	18.73	0.32	0.89	0.40	OK	0.53	OK	0.06	0.00	-0.47		-0.53	2.48	2.47	OK
82			TH-PY RD M9	TH-PY RD M10	1	1	C		30.00	2044.14	1.936	1.923	3.39	231.20	2.25	6.021	0.000	6.021	88	200	203	DWC	2308	520	0.010	0.60	18.73	0.32	0.89	0.40	OK	0.53	OK	0.06	0.00	-0.53		-0.59	2.47	2.51	OK
83			TH-PY RD M10	TH-PY RD M11	1	1	C		30.00	2074.14	1.923	1.910	3.39	234.59	2.25	6.109	0.000	6.109	89	200	203	DWC	2308	520	0.010	0.60	18.73	0.33	0.90	0.40	OK	0.54	OK	0.06	0.00	-0.59		-0.65	2.51	2.56	OK
84			TH-PY RD M11	TH-PY RD M12	1	1	C		30.00	2104.14	1.910	1.814	3.39	237.98	2.25	6.197	0.000	6.197	89	200	203	DWC	313	520	0.010	0.60	18.73	0.33	0.90	0.40	OK	0.54	OK	0.06	0.00	-0.65		-0.71	2.56	2.52	OK
85			TH-PY RD M12	TH-PY RD M13	1	1	C		20.84	2124.98	1.814	1.774	2.36	240.34	2.25	6.259	0.000	6.259	90	200	203	DWC	521	520	0.010	0.60	18.73	0.33	0.90	0.40	OK	0.54	OK	0.04	0.00	-0.71		-0.75	2.52	2.52	OK
86			AZD RD M45	AZD RD M46	0	1	H		30.00	30.00	2.305	2.250	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	545	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.20		1.03	1.11	1.22	OK
87			AZD RD M46	AZD RD M47	1	1	C		25.00	55.00	2.250	2.173	2.83	6.22	2.25	0.162	0.000	0.162	15	200	203	DWC	325	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	1.03		0.89	1.22	1.28	OK
88			CTP RD M3	CTP RD M2	0	1	H		20.34	20.34	2.174	2.154	2.30	2.30	2.25	0.060	0.000	0.060	9	200	203	DWC	1017	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.07		0.96	1.10	1.19	OK
89			CTP RD M2	CTP RD M1	1	1	C		25.00	45.34	2.154	2.110	2.83	5.13	2.25	0.134	0.000	0.134	14	200	203	DWC	568	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.96		0.82	1.19	1.29	OK
90			CTP RD M1	AZD RD M47	1	1	C		30.00	75.34	2.110	2.173	3.39	8.52	2.25	0.222	0.000	0.222	17	200	203	DWC	-476	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.82		0.65	1.29	1.52	OK
91			AZD RD M47	AZD RD M48	2	1	J		28.00	158.34	2.173	1.949	3.17	17.91	2.25	0.466	0.000	0.466	25	200	203	DWC	125	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	0.65	0.650	0.49	1.52	1.46	OK
92			AZD RD M48	AZD RD M49	1	1	C		30.00	188.34	1.949	1.832	3.39	21.30	2.25	0.555	0.000	0.555	27	200	203	DWC	256	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.49		0.42	1.46	1.41	OK
93			AZD RD M49.2	AZD RD M49.1	0	1	H		30.00	30.00	1.854	1.845	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	3333	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.75		0.58	1.10	1.27	OK
94			AZD RD M49.1	AZD RD M49	1	1	C		30.00	60.00	1.845	1.832	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	2308	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.58		0.41	1.27	1.42	OK
95			AZD RD M49	AZD RD M50	2	1	J		11.00	259.34	1.832	2.007	1.24	29.33	2.25	0.764	0.000	0.764	32	200	203	DWC	-63	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.02	0.00	0.41	0.410	0.39	1.42	1.62	OK
96			NV RD M5	NV RD M4	0	1	H		16.00	16.00	2.144	2.175	1.81	1.81	2.25	0.047	0.000	0.047	8	200	203	DWC	-516	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	1.04		0.95	1.10	1.23	OK
97			NV RD M4.1	NV RD M4	0	1	H		22.00	22.00	2.173	2.175	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	-11000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	1.07		0.95	1.10	1.23	OK
98			NV RD M4	NV RD M3	2	1	J		14.00	52.00	2.175	2.137	1.58	5.88	2.25	0.153	0.000	0.153	14	200	203	DWC	368	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.95	0.950	0.87	1.23	1.27	OK
99			NV RD M3	NV RD M2	1	1	C		24.00	76.00	2.137	2.042	2.71	8.60	2.25	0.224	0.000																								

Sl. No.	Road	Element	Man Holes										FLOWS LPS					Proposed Size of Sewer in mm					As per Manning Table			At Ultimate peak flow								Invert Level in m			Depth of cutting in m		Check Depth of cutting			
			From	To			Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day		Peak Factor	Cum Peak Factor	GW+UAC	Total Flow	Required dia.	ID	OD	MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)	Fall m	Manhole Drop m	From	To	Starting Manhole	Ending manhole	
134			BM RD M1	BM RD M2	1	1	C		30.00		145.00	1.684	1.729	3.39	16.40	2.25	0.427	0.000	0.427	24	200	203	DWC	-667	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.01	-0.16	1.67	1.89	OK	
135			BM RD M2	BM RD M3	1	1	C		30.00		175.00	1.729	1.680	3.39	19.79	2.25	0.515	0.000	0.515	26	200	203	DWC	612	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	-0.16	-0.25	1.89	1.93	OK	
136			BM RD M3	BM RD M4	1	1	C		27.11		202.12	1.680	1.729	3.07	22.86	2.25	0.595	0.000	0.595	28	200	203	DWC	-553	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.06	0.00	-0.25	-0.31	1.93	2.04	OK	
137			BM RD M10	BM RD M9	0	1	H		30.00		30.00	2.303	2.084	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	137	137	0.010	1.16	36.50	0.00	0.30	0.07	OK	0.35	OK	0.22	0.00	1.20	0.98	1.10	1.10	OK	
138			BM RD M9	BM RD M8	1	1	C		30.00		60.00	2.084	2.005	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	380	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.98	0.81	1.10	1.20	OK	
139			BM RD M8	BM RD M7	1	1	C		30.00		90.00	2.005	1.809	3.39	10.18	2.25	0.265	0.000	0.265	19	200	203	DWC	153	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.81	0.64	1.20	1.17	OK	
140			BM RD M7	BM RD M6	1	1	C		9.00		99.00	1.809	1.750	1.02	11.20	2.25	0.292	0.000	0.292	20	200	203	DWC	153	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.05	0.00	0.64	0.59	1.17	1.16	OK	
141			BM RD M6	BM RD M5	1	1	C		7.00		106.00	1.750	1.717	0.79	11.99	2.25	0.312	0.000	0.312	20	200	203	DWC	212	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.04	0.00	0.59	0.55	1.16	1.17	OK	
142			BM RD M5	BM RD M4	1	1	C		16.00		122.00	1.714	1.729	1.81	13.80	2.25	0.359	0.000	0.359	22	200	203	DWC	-1067	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	0.55	0.46	1.16	1.27	OK	
143			BM RD M4.1.1	BM RD M4	0	1	H		24.00		24.00	1.654	1.729	2.71	2.71	2.25	0.071	0.000	0.071	10	200	203	DWC	-320	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	0.55	0.42	1.10	1.31	OK	
144			BM RD M4	BM RD M4.1	3	1	J		25.00		373.12	1.729	1.742	2.83	42.20	2.25	1.099	0.000	1.099	38	200	203	DWC	-1923	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.05	0.00	-0.31	-0.310	-0.36	2.04	2.10	OK
145			BM RD M4.1	BM RD M4.2	1	1	C		30.00		403.12	1.742	1.724	3.39	45.59	2.25	1.187	0.000	1.187	39	200	203	DWC	1667	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	-0.36	-0.42	2.10	2.14	OK	
146			BM RD M4.2	BM RD M4.3	1	1	C		22.00		425.12	1.724	1.696	2.49	48.08	2.25	1.252	0.000	1.252	40	200	203	DWC	786	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.04	0.00	-0.42	-0.46	2.14	2.16	OK	
147			BM RD M4.3.1	BM RD M4.3	0	1	H		29.92		29.92	1.702	1.694	3.38	3.38	2.25	0.088	0.000	0.088	11	200	203	DWC	3740	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.60	0.43	1.10	1.26	OK	
148			BM RD M4.3	BM RD M4.4	2	1	J		12.00		467.04	1.694	1.706	1.36	52.82	2.25	1.376	0.000	1.376	42	200	203	DWC	-1000	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.02	0.00	-0.46	-0.460	-0.48	2.15	2.19	OK
149			BM RD M4.4	BM RD M4.5	1	1	C		30.00		497.04	1.706	1.846	3.39	56.22	2.25	1.464	0.000	1.464	44	200	203	DWC	-214	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	-0.48	-0.54	2.19	2.39	OK	
150			BM RD M4.5.1	BM RD M4.5	0	1	H		34.09		34.09	1.854	1.846	3.86	3.86	2.25	0.100	0.000	0.100	12	200	203	DWC	4261	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.19	0.00	0.75	0.56	1.10	1.29	OK	
151			BM RD M4.5	BM RD M4.6	2	1	J		30.00		561.12	1.846	1.749	3.39	63.46	2.25	1.653	0.000	1.653	46	200	203	DWC	309	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	-0.54	-0.540	-0.60	2.39	2.35	OK
152			BM RD M4.6	SFC RD M4	1	1	C		12.00		573.12	1.749	1.604	1.36	64.82	2.25	1.688	0.000	1.688	47	200	203	DWC	83	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.02	0.00	-0.60	-0.62	2.35	2.22	OK	
153			SFC RD M4	SFC RD M5	2	1	J		20.00		855.12	1.604	1.543	2.26	96.72	2.25	2.519	0.000	2.519	57	200	203	DWC	328	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.04	0.00	-0.62	-0.620	-0.66	2.22	2.20	OK
154			SFC RD M5.3	SFC RD M5.2	0	1	H		22.47		22.47	1.654	1.613	2.54	2.54	2.25	0.066	0.000	0.066	10	200	203	DWC	548	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	0.55	0.43	1.10	1.18	OK	
155			SFC RD M5.2	SFC RD M5.1	1	1	C		22.00		44.47	1.613	1.578	2.49	5.03	2.25	0.131	0.000	0.131	13	200	203	DWC	629	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	0.43	0.31	1.18	1.27	OK	
156			SFC RD M5.1	SFC RD M5	1	1	C		20.13		64.60	1.578	1.543	2.28	7.31	2.25	0.190	0.000	0.190	16	200	203	DWC	575	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.31	0.20	1.27	1.34	OK	
157			SFC RD M5	SFC RD M6	2	1	J		21.00		940.72	1.543	1.481	2.38	106.40	2.25	2.771	0.000	2.771	60	200	203	DWC	339	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.04	0.00	-0.66	-0.660	-0.70	2.20	2.18	OK
158			SFC RD M6	SFC RD M7	1	1	C		19.00		959.72	1.481	1.517	2.15	108.55	2.25	2.827	0.000	2.827	61	200	203	DWC	-528	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.04	0.00	-0.70	-0.74	2.18	2.26	OK	
159			SFC RD M7	SFC RD M8	1	1	C		30.00		989.72	1.517	1.614	3.39	111.94	2.25	2.915	0.000	2.915	61	200	203	DWC	-309	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.06	0.00	-0.74	-0.80	2.26	2.41	OK	
160			SFC RD M8	SFC RD M9	1	1	C		10.00		999.72	1.614	1.663	1.13	113.07	2.25	2.945	0.000	2.945	62	200	203	DWC	-204	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.02	0.00	-0.80	-0.82	2.41	2.48	OK	
161			SFC RD M9	SFC RD M10	1	1	C		17.00		1016.72	1.663	1.550	1.92	114.99	2.25	2.995	0.000	2.995	62	200	203	DWC	150	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.03	0.00	-0.82	-0.85	2.48	2.40	OK	
162			SFC RD M10	AZD RD M58	1	1	C		29.00		1045.72	1.550	1.642	3.28	118.27	2.25	3.080	0.000	3.080	63	200	203	DWC	-315	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.06	0.00	-0.85	-0.91	2.40	2.55	OK	
163			AZD RD M58	AZD RD M59	2	1	J		30.00		1850.86	1.642	1.694	3.39	209.34	2.25	5.451	0.000	5.451	84	200	203	DWC	-577	520	0.010	0.60	18.73	0.29	0.87	0.38	OK	0.52	OK	0.06	0.00	-0.91	-0.910	-0.97	2.55	2.66	OK
164			AZD RD M59	AZD RD M60	1	1	C		19.00		1869.86	1.694	1.750	2.15	211.49	2.25	5.507	0.000	5.507	84	200	203	DWC	-339	520	0.010	0.60	18.73	0.29	0.87	0.38	OK	0.52	OK	0.04	0.00	-0.97	-1.01	2.66	2.76	OK	
165			AZD RD M60	AZD RD M61	1	1	C		16.00		1885.86	1.750	1.924	1.81	213.30	2.25	5.555	0.000	5.555	85	200	203	DWC	-92	520	0.010	0.60	18.73	0.30	0.88	0.38	OK	0.52	OK	0.03	0.00	-1.01	-1.04	2.76	2.96	OK	
166			AZD RD M61.2	AZD RD M61.1	0	1	H		30.00		30.00	2.144	1.949	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	154	153	0.010	1.10	34.54	0.00	0.30	0.07	OK	0.33	OK	0.20	0.00	1.04	0.84	1.10	1.11	OK	
167			AZD RD M61.1	AZD RD M61	1	1	C		30.00		60.00	1.949	1.924	3.39	6.79	2.25	0.177	0.000	0.177	1																						

Sl. No.	Road	Element	Man Holes										FLOWS LPS					Proposed Size of Sewer in mm					As per Manning Table			At Ultimate peak flow								Invert Level in m			Depth of cutting in m		Check Depth of cutting			
			From	To			Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day	Peak Factor	Cum Peak Factor	GW+UAC	Total Flow	Required dia.	ID	OD	MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (>0.3m/s)	Fall m	Manhole Drop m	From	To	Starting Manhole	Ending manhole		
204			VR RD M14	VR RD M13	1	1	C		30.00		60.00	1.344	1.351	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	-4286	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.21	0.04	1.13	1.31	OK	
205			VR RD M13.4	VR RD M13.3	0	1	H		15.05		15.05	1.462	1.435	1.70	1.70	2.25	0.044	0.000	0.044	8	200	203	DWC	557	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	0.36	0.28	1.10	1.16	OK	
206			VR RD M13.3	VR RD M13.2	1	1	C		11.77		26.82	1.435	1.407	1.33	3.03	2.25	0.079	0.000	0.079	11	200	203	DWC	420	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	0.28	0.21	1.16	1.20	OK	
207			VR RD M13.2	VR RD M13.1	1	1	C		20.04		46.86	1.407	1.379	2.27	5.30	2.25	0.138	0.000	0.138	14	200	203	DWC	716	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.21	0.10	1.20	1.28	OK	
208			VR RD M13.1	VR RD M13	1	1	C		20.95		67.81	1.379	1.351	2.37	7.67	2.25	0.200	0.000	0.200	16	200	203	DWC	748	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	0.10	-0.02	1.28	1.37	OK	
209			VR RD M13	VR RD M12	2	1	J		19.88		147.69	1.351	1.359	2.25	16.70	2.25	0.435	0.000	0.435	24	200	203	DWC	-2485	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	-0.02	-0.020	-0.13	1.37	1.49	OK
210			VR RD M12	VR RD M11	1	1	C		30.00		177.69	1.359	1.366	3.39	20.10	2.25	0.523	0.000	0.523	26	200	203	DWC	-4286	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	-0.13	-0.20	1.49	1.57	OK	
211			VR RD M11	VR RD M10	1	1	C		30.00		207.69	1.366	1.333	3.39	23.49	2.25	0.612	0.000	0.612	28	200	203	DWC	909	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	-0.20	-0.27	1.57	1.60	OK	
212			VR RD M10	VR RD M9	1	1	C		19.00		226.69	1.333	1.301	2.15	25.64	2.25	0.668	0.000	0.668	30	200	203	DWC	594	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.04	0.00	-0.27	-0.31	1.60	1.61	OK	
213			VR RD M9	VR RD M8	2	1	J		39.25		5261.84	1.301	1.316	4.44	595.13	2.25	15.498	0.000	15.498	141	200	203	DWC	-2617	520	0.010	0.60	18.73	0.83	1.12	0.70	OK	0.67	OK	0.08	0.00	-2.21	-2.210	-2.29	3.51	3.61	OK
214			VR RD M8	VR RD M7	1	1	C		30.54		5292.38	1.316	1.330	3.45	598.58	2.25	15.588	0.000	15.588	141	200	203	DWC	-2182	520	0.010	0.60	18.73	0.83	1.12	0.70	OK	0.67	OK	0.06	0.00	-2.29	-2.35	3.61	3.68	OK	
215			VR RD M7.5	VR RD M7.4	0	1	H		35.00		35.00	1.591	1.425	3.96	3.96	2.25	0.103	0.000	0.103	12	200	203	DWC	211	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.19	0.00	0.49	0.30	1.10	1.13	OK	
216			VR RD M7.4	VR RD M7.3	1	1	C		30.00		65.00	1.425	1.417	3.39	7.35	2.25	0.191	0.000	0.191	16	200	203	DWC	3750	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.30	0.13	1.13	1.29	OK	
217			VR RD M7.3	VR RD M7.2	1	1	C		30.00		95.00	1.417	1.483	3.39	10.74	2.25	0.280	0.000	0.280	19	200	203	DWC	-455	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.13	-0.04	1.29	1.52	OK	
218			VR RD M7.2	VR RD M7.1	1	1	C		29.97		124.97	1.483	1.549	3.39	14.13	2.25	0.368	0.000	0.368	22	200	203	DWC	-454	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.04	-0.21	1.52	1.76	OK	
219			VR RD M7.1	VR RD M7	1	1	C		30.04		155.01	1.549	1.330	3.40	17.53	2.25	0.457	0.000	0.457	25	200	203	DWC	137	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	-0.21	-0.38	1.76	1.71	OK	
220			VR RD M7	VR RD M6	2	1	J		26.75		5474.14	1.330	1.341	3.03	619.14	2.25	16.123	0.000	16.123	144	250	253	DWC	-2432	700	0.010	0.60	29.28	0.55	1.02	0.53	OK	0.61	OK	0.04	0.00	-2.35	-2.350	-2.39	3.68	3.73	OK
221			VR RD M6.1	VR RD M6	0	1	H		29.66		29.66	1.314	1.341	3.35	3.35	2.25	0.087	0.000	0.087	11	250	253	DWC	-1098	180	0.010	1.17	57.74	0.00	0.30	0.07	OK	0.35	OK	0.16	0.00	0.16	0.00	1.15	1.34	OK	
222			VR RD M6	VR RD M5	2	1	J		16.25		5520.05	1.341	1.374	1.84	624.33	2.25	16.259	0.000	16.259	144	250	253	DWC	-492	700	0.010	0.60	29.28	0.56	1.03	0.54	OK	0.61	OK	0.02	0.00	-2.39	-2.390	-2.41	3.73	3.78	OK
223			VR RD M5.3	VR RD M5.2	0	1	H		20.50		20.50	1.203	1.425	2.32	2.32	2.25	0.060	0.000	0.060	9	200	203	DWC	-92	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.10	-0.01	1.10	1.44	OK	
224			VR RD M5.2	VR RD M5.1	1	1	C		41.29		61.78	1.425	2.402	4.67	6.99	2.25	0.182	0.000	0.182	16	200	203	DWC	-42	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.23	0.00	-0.01	-0.24	1.44	2.64	OK	
225			VR RD M5.1	VR RD M5	1	1	C		35.00		96.78	2.402	1.374	3.96	10.95	2.25	0.285	0.000	0.285	20	200	203	DWC	34	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	-0.24	-0.43	2.64	1.80	OK	
226			VR RD M5	VR RD M4	2	1	J		19.03		5635.85	1.374	1.414	2.15	637.43	2.25	16.600	0.000	16.600	146	250	253	DWC	-476	700	0.010	0.60	29.28	0.57	1.03	0.54	OK	0.61	OK	0.03	0.00	-2.41	-2.410	-2.44	3.78	3.85	OK
227			VR RD M4	VR RD M3	1	1	C		30.00		5665.85	1.414	1.585	3.39	640.82	2.25	16.688	0.000	16.688	146	250	253	DWC	-175	700	0.010	0.60	29.28	0.57	1.03	0.54	OK	0.61	OK	0.04	0.00	-2.44	-2.48	3.85	4.07	OK	
228			VR RD M3	VR RD M2	1	1	C		30.00		5695.85	1.585	1.624	3.39	644.21	2.25	16.776	0.000	16.776	147	250	253	DWC	-769	700	0.010	0.60	29.28	0.57	1.03	0.54	OK	0.61	OK	0.04	0.00	-2.48	-2.52	4.07	4.14	OK	
229			VR RD M2	VR RD M1	1	1	C		30.00		5725.85	1.624	1.668	3.39	647.61	2.25	16.865	0.000	16.865	147	250	253	DWC	-682	700	0.010	0.60	29.28	0.58	1.03	0.55	OK	0.61	OK	0.04	0.00	-2.52	-2.56	4.14	4.23	OK	
230			KTH RD M3	KTH RD M4	0	1	H		30.00		30.00	1.963	1.882	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	370	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.86	0.69	1.10	1.19	OK	
231			KTH RD M4	VR RD M1	1	1	C		28.57		58.57	1.882	1.668	3.23	6.62	2.25	0.173	0.000	0.173	15	200	203	DWC	134	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	0.69	0.53	1.19	1.14	OK	
232			VR RD M1.2	VR RD M1.1	0	1	H		39.27		39.27	1.794	1.734	4.44	4.44	2.25	0.116	0.000	0.116	13	200	203	DWC	655	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.22	0.00	0.69	0.47	1.10	1.26	OK	
233			VR RD M1.1	VR RD M1	1	1	C		35.00		74.27	1.734	1.668	3.96	8.40	2.25	0.219	0.000	0.219	17	200	203	DWC	530	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	0.47	0.28	1.26	1.39	OK	
234			VR RD M1	VBW L M17	3	1	J		30.00		5888.70	1.668	1.754	3.39	666.02	2.25	17.344	0.000	17.344	149	250	253	DWC	-349	700	0.010	0.60	29.28	0.59	1.04	0.56	OK	0.62	OK	0.04	0.00	-2.56	-2.560	-2.60	4.23	4.35	OK
235			VBW L M17	VBW L M16	1	1	C		35.00		5923.70	1.754	1.704	3.96	669.98	2.25	17.447	0.000	17.447	150	250	253	DWC	700	700	0.010	0.60	29.28	0.60	1.04	0.56	OK	0.62	OK	0.05	0.00	-2.60	-2.65	4.35	4.35	OK	
236			VBW L M16	VBW L M15	1	1	C		30.00		5953.70	1.704	1.624	3.39	673.38	2.25	17.536	0.000	17.536	150	250	253	DWC	375	700	0.010	0.60	29.28	0.60	1.04	0.56	OK	0.62	OK	0.04	0.00	-2.65	-2.69	4.35	4.31	OK	
237			VBW L M15	VBW L M14	1	1	C		30.00		5983.70	1.624																														

Sl. No.	Road	Element	Man Holes										FLOWS LPS					Proposed Size of Sewer in mm					As per Manning Table			At Ultimate peak flow								Invert Level in m			Depth of cutting in m		Check Depth of cutting			
			From	To			Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day	Peak Factor	Cum Peak Factor	GW+UAC	Total Flow	Required dia.	ID	OD	MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	Manning's n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (>0.3m/s)	Fall m	Manhole Drop m	From	To	Starting Manhole	Ending manhole		
274			VBW L M4	VBW L M3	2	1	J		14.00		6918.50	2.134	2.214	1.58	782.50	2.25	20.378	0.000	20.378	162	250	253	DWC	-175	700	0.010	0.60	29.28	0.70	1.08	0.62	OK	0.64	OK	0.02	0.00	-0.49	-0.490	-0.51	2.62	2.72	OK
275			VBW L M3	VBW L M2	1	1	C		10.00		6928.50	2.214	2.300	1.13	783.63	2.25	20.407	0.000	20.407	162	250	253	DWC	-116	700	0.010	0.60	29.28	0.70	1.08	0.62	OK	0.64	OK	0.01	0.00	-0.51		-0.52	2.72	2.82	OK
276			VBW L M2.4	VBW L M2.3	0	1	H		30.00		30.00	2.394	2.320	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	405	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.29		1.12	1.10	1.20	OK
277			VBW L M2.3	VBW L M2.2	1	1	C		20.96		50.96	2.320	2.361	2.37	5.76	2.25	0.150	0.000	0.150	14	200	203	DWC	-511	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	1.12		1.00	1.20	1.36	OK
278			VBW L M2.2.1	VBW L M2.2	0	1	H		10.00		10.00	2.340	2.361	1.13	1.13	2.25	0.029	0.000	0.029	7	200	203	DWC	-476	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	1.24		1.18	1.10	1.18	OK
279			VBW L M2.2	VBW L M2.1	2	1	J		15.00		75.96	2.361	2.332	1.70	8.59	2.25	0.224	0.000	0.224	17	200	203	DWC	517	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	1.00	1.000	0.92	1.36	1.41	OK
280			VBW L M2.1	VBW L M2	1	1	C		30.00		105.96	2.332	2.300	3.39	11.98	2.25	0.312	0.000	0.312	20	200	203	DWC	937	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.92		0.75	1.41	1.55	OK
281			VBW L M2	VBW L M1	2	1	J		8.00		7042.46	2.300	2.351	0.90	796.52	2.25	20.743	0.000	20.743	163	200	250	DWC	-157	700	0.010	0.51	16.15	1.28	1.14	0.82	Check	0.58	OK	0.01	0.00	-0.52	-0.520	-0.53	2.82	2.88	OK
282			VBW L M1	VPY L M10	1	1	C		21.00		7063.46	2.351	2.201	2.38	798.89	2.25	20.804	0.000	20.804	163	200	250	DWC	140	700	0.010	0.51	16.15	1.29	1.14	0.82	Check	0.58	OK	0.03	0.00	-0.53		-0.56	2.88	2.76	OK
283			AZ RD M39.1	AZ RD M39.2	0	1	H		17.00		17.00	3.183	3.207	1.92	1.92	2.25	0.050	0.000	0.050	8	200	203	DWC	-708	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.08		1.99	1.10	1.22	OK
284			AZ RD M39.2	AZ RD M39.3	1	1	C		30.00		47.00	3.207	3.036	3.39	5.32	2.25	0.138	0.000	0.138	14	200	203	DWC	175	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.99		1.82	1.22	1.22	OK
285			AZ RD M39.3	AZ RD M39.4	1	1	C		19.00		66.00	3.036	2.853	2.15	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	104	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.82		1.71	1.22	1.14	OK
286			AZ RD M39.4	AZ RD M39.5	1	1	C		30.00		96.00	2.853	2.736	3.39	10.86	2.25	0.283	0.000	0.283	19	200	203	DWC	256	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.71		1.54	1.14	1.20	OK
287			AZ RD M39.5	AZ RD M39.6	1	1	C		30.00		126.00	2.734	2.738	3.39	14.25	2.25	0.371	0.000	0.371	22	200	203	DWC	-7500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.54		1.37	1.19	1.37	OK
288			AZ RD M39.6	AZ RD M39.7	1	1	C		19.00		145.00	2.738	2.661	2.15	16.40	2.25	0.427	0.000	0.427	24	200	203	DWC	247	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.37		1.26	1.37	1.40	OK
289			AZ RD M39.7	AZ RD M39.8	1	1	C		30.00		175.00	2.661	2.562	3.39	19.79	2.25	0.515	0.000	0.515	26	200	203	DWC	303	180	0.010	1.01	31.84	0.02	0.40	0.10	OK	0.40	OK	0.17	0.00	1.26		1.09	1.40	1.47	OK
290			AZ RD M39.8	VPY L M4	1	1	C		30.00		205.00	2.562	2.463	3.39	23.19	2.25	0.604	0.000	0.604	28	200	203	DWC	303	180	0.010	1.01	31.84	0.02	0.40	0.10	OK	0.40	OK	0.17	0.00	1.09		0.92	1.47	1.54	OK
291			VPY L M1	VPY L M2	0	1	H		22.80		22.80	3.003	3.134	2.58	2.58	2.25	0.067	0.000	0.067	10	200	203	DWC	-174	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	1.90		1.77	1.10	1.36	OK
292			VPY L M2	VPY L M3	1	1	C		28.00		50.80	3.134	2.500	3.17	5.75	2.25	0.150	0.000	0.150	14	200	203	DWC	44	75	0.010	1.57	49.33	0.00	0.30	0.07	OK	0.47	OK	0.37	0.00	1.77		1.40	1.36	1.10	OK
293			VPY L M3.2	VPY L M3.1	0	1	H		14.71		14.71	2.681	2.590	1.66	1.66	2.25	0.043	0.000	0.043	8	200	203	DWC	162	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.09	0.00	1.58		1.49	1.10	1.10	OK
294			VPY L M3.1	VPY L M3	1	1	C		25.00		39.71	2.590	2.500	2.83	4.49	2.25	0.117	0.000	0.117	13	200	203	DWC	278	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	1.49		1.35	1.10	1.15	OK
295			VPY L M3	VPY L M4	2	1	J		17.00		107.51	2.500	2.463	1.92	12.16	2.25	0.317	0.000	0.317	21	200	203	DWC	459	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	1.35	1.350	1.26	1.15	1.20	OK
296			VPY L M4	VPY L M5	2	1	J		30.00		342.51	2.463	2.416	3.39	38.74	2.25	1.009	0.000	1.009	36	200	203	DWC	638	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	0.92	0.920	0.86	1.54	1.56	OK
297			VPY L M5	VPY L M6	1	1	C		30.00		372.51	2.416	2.351	3.39	42.13	2.25	1.097	0.000	1.097	38	200	203	DWC	462	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	0.86		0.80	1.56	1.55	OK
298			VPY L M6.5	VPY L M6.4	0	1	H		18.00		18.00	2.034	2.061	2.04	2.04	2.25	0.053	0.000	0.053	9	200	203	DWC	-667	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	0.93		0.83	1.10	1.23	OK
299			VPY L M6.4	VPY L M6.3	1	1	C		20.00		38.00	2.061	2.299	2.26	4.30	2.25	0.112	0.000	0.112	12	200	203	DWC	-84	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.83		0.72	1.23	1.58	OK
300			VPY L M6.3	VPY L M6.2	1	1	C		30.00		68.00	2.299	2.352	3.39	7.69	2.25	0.200	0.000	0.200	16	200	203	DWC	-566	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.72		0.55	1.58	1.80	OK
301			VPY L M6.2	VPY L M6.1	1	1	C		17.00		85.00	2.352	2.413	1.92	9.61	2.25	0.250	0.000	0.250	18	200	203	DWC	-279	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	0.55		0.46	1.80	1.95	OK
302			VPY L M6.1	VPY L M6	1	1	C		25.00		110.00	2.413	2.351	2.83	12.44	2.25	0.324	0.000	0.324	21	200	203	DWC	403	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	0.46		0.32	1.95	2.03	OK
303			VPY L M6	VPY L M7	2	1	J		30.00		512.51	2.351	2.401	3.39	57.97	2.25	1.510	0.000	1.510	44	200	203	DWC	-600	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	0.32	0.320	0.26	2.03	2.14	OK
304			VPY L M7.2	VPY L M7.1	0	1	H		30.00		30.00	2.454	2.428	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	1154	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.35		1.18	1.10	1.25	OK
305			VPY L M7.1	VPY L M7	1	1	C		30.00		60.00	2.428	2.401	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	1111	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.18		1.01	1.25	1.39	OK
306			VPY L M7	VPY L M8	2	1	J		30.00		602.51	2.401	2.417	3.39	68.15	2.25	1.775	0.000	1.775	48	200	203	DWC	-1875	180	0.010	1.01	31.84	0.06	0.55	0.17	OK	0.56	OK	0.17	0.00	0.26	0.260	0.09	2.14	2.33	OK

Sl. No.	Road	Element	Man Holes			Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting	
			From	To							Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s			Check Velocity (> 0.3m/s)	From	To	Starting Manhole	Ending manhole		
344			AZDRDM15.3	AZDRDM15.2	0	1	H	30.00		30.00	3.713	3.954	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	-124	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.61		2.44	1.10	1.51	OK
345			AZDRDM15.2	AZDRDM15.1	1	1	C	30.00		60.00	3.954	3.932	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	1364	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.44		2.27	1.51	1.66	OK
346			AZDRDM15.1	AZDRDM15	1	1	C	30.00		90.00	3.932	3.800	3.39	10.18	2.25	0.265	0.000	0.265	19	200	203	DWC	227	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.27		2.10	1.66	1.70	OK
347			AZDRDM15	AZDRDM16	2	1	J	30.00		150.00	3.800	3.813	3.39	16.97	2.25	0.442	0.000	0.442	24	200	203	DWC	-2308	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.10	2.100	1.93	1.70	1.88	OK
348			AZDRDM16	AZDRDM17	1	1	C	30.00		180.00	3.813	3.827	3.39	20.36	2.25	0.530	0.000	0.530	26	200	203	DWC	-2143	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.93		1.84	1.88	1.99	OK
349			AZDRDM17	AZDRDM18	1	1	C	30.00		210.00	3.827	3.973	3.39	23.75	2.25	0.619	0.000	0.619	29	200	203	DWC	-205	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	1.84		1.77	1.99	2.20	OK
350			AZDRDM18	AZDRDM19	1	1	C	30.00		240.00	3.973	3.928	3.39	27.14	2.25	0.707	0.000	0.707	31	200	203	DWC	667	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	1.77		1.71	2.20	2.22	OK
351			AZDRDM19	CHRTRKLM1	1	1	C	25.00		265.00	3.928	3.982	2.83	29.97	2.25	0.781	0.000	0.781	32	200	203	DWC	-463	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	1.71		1.66	2.22	2.32	OK
352			CHRTRKLM1	CHRTRKLM2	2	1	J	30.00		998.51	3.982	4.023	3.39	112.93	2.25	2.941	0.000	2.941	62	200	203	DWC	-732	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.06	0.00	1.25	1.250	1.19	2.73	2.83	OK
353			CHRTRKLM2	CHRTRKLM3	1	1	C	30.00		1028.51	4.023	3.859	3.39	116.33	2.25	3.029	0.000	3.029	63	200	203	DWC	183	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.06	0.00	1.19		1.13	2.83	2.73	OK
354			CHRTRKLM3	CHRTRKLM4	1	1	C	30.00		1058.51	3.859	3.673	3.39	119.72	2.25	3.118	0.000	3.118	64	200	203	DWC	161	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.06	0.00	1.13		1.07	2.73	2.60	OK
355			CHRTRKLM4	CHRTRKLM5	1	1	C	22.88		1081.38	3.673	3.832	2.59	122.31	2.25	3.185	0.000	3.185	64	200	203	DWC	-144	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.04	0.00	1.07		1.03	2.60	2.80	OK
356			CHRTRKLM5	CHRTRKLM6	1	1	C	30.00		1111.38	3.832	3.841	3.39	125.70	2.25	3.273	0.000	3.273	65	200	203	DWC	-3333	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.06	0.00	1.03		0.97	2.80	2.87	OK
357			CHRTRKLM6	CHRTRKLM7	1	1	C	30.00		1141.38	3.841	3.673	3.39	129.09	2.25	3.362	0.000	3.362	66	200	203	DWC	179	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.06	0.00	0.97		0.91	2.87	2.76	OK
358			CHRTRKLM7	CHRTRKLM8	1	1	C	30.00		1171.38	3.673	3.570	3.39	132.49	2.25	3.450	0.000	3.450	67	200	203	DWC	291	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.06	0.00	0.91		0.85	2.76	2.72	OK
359			CHRTRKLM8	CHRTRKLM9	1	1	C	20.35		1191.73	3.570	3.564	2.30	134.79	2.25	3.510	0.000	3.510	67	200	203	DWC	3392	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.04	0.00	0.85		0.81	2.72	2.75	OK
360			CHRTRKLM9	CHRTRKLM9.1	1	1	C	22.00		1213.73	3.564	3.548	2.49	137.28	2.25	3.575	0.000	3.575	68	200	203	DWC	1375	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.04	0.00	0.81		0.77	2.75	2.78	OK
361			CHRTRKLM9.1	PSRDM7.1	1	1	C	30.00		1243.73	3.548	3.508	3.39	140.67	2.25	3.663	0.000	3.663	69	200	203	DWC	750	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.06	0.00	0.77		0.71	2.78	2.80	OK
362			PSRDM1.1	PSRDM1	0	1	H	22.00		22.00	3.954	4.394	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	-50	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	2.85		2.73	1.10	1.66	OK
363			PSRDM1	PSRDM2	1	1	C	30.05		52.05	4.394	4.200	3.40	5.89	2.25	0.153	0.000	0.153	14	200	203	DWC	155	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.73		2.56	1.66	1.64	OK
364			PSRDM2	PSRDM3	1	1	C	35.00		87.05	4.200	4.032	3.96	9.85	2.25	0.256	0.000	0.256	19	200	203	DWC	208	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	2.56		2.37			

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW+UAC	Total Flow		ID	OD				Manning's n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s			Check Velocity (> 0.3m/s)	From	To	Starting Manhole	Ending manhole		
414			PON RD M 24	PON RD M 25	1	1	C		30.00		725.50	2.522	2.739	3.39	82.06	2.25	2.137	0.000	2.137	53	200	203	DWC	-138	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	0.86		0.80	1.66	1.94	OK
415			MKM L2 M4	MKM L2 M3	0	1	H		34.00		34.00	2.772	2.776	3.85	3.85	2.25	0.100	0.000	0.100	12	200	203	DWC	-8500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.19	0.00	1.67		1.48	1.10	1.30	OK
416			MKM L2 M3	MKM L2 M2	1	1	C		30.00		64.00	2.776	2.786	3.39	7.24	2.25	0.189	0.000	0.189	16	200	203	DWC	-3000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.48		1.31	1.30	1.48	OK
417			MKM L2 M2	MKM L2 M1	1	1	C		30.00		94.00	2.786	2.791	3.39	10.63	2.25	0.277	0.000	0.277	19	200	203	DWC	-6000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.31		1.14	1.48	1.65	OK
418			MKM L2 M1	PON RD M 25	1	1	C		30.00		124.00	2.791	2.739	3.39	14.02	2.25	0.365	0.000	0.365	22	200	203	DWC	577	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.14		0.97	1.65	1.77	OK
419			PON RD M 25	PON RD M 26	2	1	J		14.29		863.79	2.739	2.532	1.62	97.70	2.25	2.544	0.000	2.544	57	200	203	DWC	69	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.03	0.00	0.80	0.800	0.77	1.94	1.76	OK
420			PON RD M 26	PON RD M 27	1	1	C		35.00		898.79	2.532	2.587	3.96	101.65	2.25	2.647	0.000	2.647	59	200	203	DWC	-636	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.07	0.00	0.77		0.70	1.76	1.89	OK
421			PON RD M 27.2	PON RD M 27.1	0	1	H		33.48		33.48	2.732	2.727	3.79	3.79	2.25	0.099	0.000	0.099	12	200	203	DWC	6695	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.19	0.00	1.63		1.44	1.10	1.29	OK
422			PON RD M 27.1	PON RD M 27	1	1	C		14.02		47.49	2.727	2.587	1.59	5.37	2.25	0.140	0.000	0.140	14	200	203	DWC	100	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	1.44		1.36	1.29	1.23	OK
423			PON RD M 27	PON RD M 28	2	1	J		30.00		976.28	2.587	2.519	3.39	110.42	2.25	2.876	0.000	2.876	61	200	203	DWC	441	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.06	0.00	0.70	0.700	0.64	1.89	1.88	OK
424			PC RDM13	PC RDM14	0	1	H		30.00		30.00	3.120	3.112	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	3750	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.02		1.85	1.10	1.26	OK
425			PC RDM14	PC RDM15	1	1	C		30.00		60.00	3.112	2.680	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	69	110	0.010	1.29	40.73	0.00	0.30	0.07	OK	0.39	OK	0.27	0.00	1.85		1.58	1.26	1.10	OK
426			PC RDM15	PON RD M 28	1	1	C		20.00		80.00	2.680	2.519	2.26	9.05	2.25	0.236	0.000	0.236	18	200	203	DWC	124	120	0.010	1.24	39.00	0.01	0.30	0.07	OK	0.37	OK	0.17	0.00	1.58		1.41	1.10	1.11	OK
427			PON RD M 28	PON-AZH RD M 29	2	1	J		30.00		1086.28	2.519	2.639	3.39	122.86	2.25	3.199	0.000	3.199	64	200	203	DWC	-250	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.06	0.00	0.64	0.640	0.58	1.88	2.06	OK
428			PON-AZH RD M 29	PON RD M 30	2	1	J		30.00		1231.28	2.639	2.458	3.39	139.26	2.25	3.627	0.000	3.627	68	200	203	DWC	166	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.06	0.00	0.57	0.570	0.51	2.07	1.95	OK
429			PON RD M 30	PON-ASC RD M 31	1	1	C		30.00		1261.28	2.458	2.296	3.39	142.65	2.25	3.715	0.000	3.715	69	200	203	DWC	185	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.06	0.00	0.51		0.45	1.95	1.85	OK
430			PON-ASC RD M 31	PON RD M 32	1	1	C		30.00		1291.28	2.296	2.300	3.39	146.05	2.25	3.803	0.000	3.803	70	200	203	DWC	-7500	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.06	0.00	0.45		0.39	1.85	1.91	OK
431			PON RD M 32.3	PON RD M 32.2	0	1	H		22.00		22.00	2.160	2.211	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	-431	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	1.06		0.94	1.10	1.27	OK
432			PON RD M 32.2	PON RD M 32.1	1	1	C		30.00		52.00	2.211	2.292	3.39	5.88	2.25	0.153	0.000	0.153	14	200	203	DWC	-370	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.94		0.77	1.27	1.52	OK
433			PON RD M 32.1	PON RD M 32	1	1	C		34.00		86.00	2.292	2.300	3.85	9.73	2.25	0.253	0.000	0.253	18	200	203	DWC	-4250	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	0.77		0.58	1.52	1.72	OK
434			PON RD M 32	PON RD M 33	2	1	J		25.00		1402.28	2.300	2.027	2.83	158.60	2.25	4.130	0.000	4.130	73	200	203	DWC	92	520	0.010	0.															

Sl. No.	Road	Element	Man Holes					Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity (> 0.3m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
			From	To									Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW+UAC	Total Flow		ID	OD				Manning's n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole	
484			PC RD M 6.2	PC RD M 6.3	1	1	C			30.00		271.27	2.824	2.735	3.39	30.68	2.25	0.799	0.000	0.799	32	200	203	DWC	337	400	0.010	0.68	21.36	0.04	0.51	0.15	OK	0.35	OK	0.08	0.00	1.71		1.63	1.11	1.11	OK
485			PC RD M 6.3	PC RD M 6.4	1	1	C			30.00		301.27	2.735	2.644	3.39	34.07	2.25	0.887	0.000	0.887	34	200	203	DWC	330	320	0.010	0.76	23.88	0.04	0.51	0.15	OK	0.39	OK	0.09	0.00	1.63		1.54	1.11	1.10	OK
486			PC RD M 6.4	PC RD M 6.5	1	1	C			30.00		331.27	2.644	2.599	3.39	37.47	2.25	0.976	0.000	0.976	36	200	203	DWC	667	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	1.54		1.48	1.10	1.12	OK
487			PC RD M 6.5	PON RD M 33.7	1	1	C			9.82		341.09	2.599	2.554	1.11	38.58	2.25	1.005	0.000	1.005	36	200	203	DWC	218	320	0.010	0.76	23.88	0.04	0.51	0.15	OK	0.39	OK	0.03	0.00	1.48		1.45	1.12	1.10	OK
488			PON RD M 33.7	AH LN RD M 10	2	1	J			20.00		4679.10	2.554	2.433	2.26	529.22	2.25	13.782	0.000	13.782	133	200	203	DWC	165	520	0.010	0.60	18.73	0.74	1.09	0.64	OK	0.65	OK	0.04	0.00	-1.08	-1.080	-1.12	3.63	3.55	OK
489			AH LN RD M 1	AH LN RD M 2	0	1	H			30.00		30.00	3.584	3.235	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	86	86	0.010	1.46	46.07	0.00	0.30	0.07	OK	0.44	OK	0.35	0.00	2.48		2.13	1.10	1.11	OK
490			AH LN RD M 2	AH LN RD M 3	1	1	C			30.00		60.00	3.235	3.103	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	227	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.13		1.96	1.11	1.14	OK
491			AH LN RD M 3	AH LN RD M 4	1	1	C			30.00		90.00	3.103	2.831	3.39	10.18	2.25	0.265	0.000	0.265	19	200	203	DWC	110	130	0.010	1.19	37.47	0.01	0.30	0.07	OK	0.36	OK	0.23	0.00	1.96		1.73	1.14	1.10	OK
492			AH LN RD M 4	AH LN RD M 5	1	1	C			31.38		121.38	2.831	2.642	3.55	13.73	2.25	0.357	0.000	0.357	22	200	203	DWC	166	166	0.010	1.05	33.16	0.01	0.30	0.07	OK	0.32	OK	0.19	0.00	1.73		1.54	1.10	1.10	OK
493			AH LN RD M 5	AH LN RD M 6	1	1	C			30.00		151.38	2.642	2.428	3.39	17.12	2.25	0.446	0.000	0.446	24	200	203	DWC	140	135	0.010	1.17	36.77	0.01	0.30	0.07	OK	0.35	OK	0.22	0.00	1.54		1.32	1.10	1.11	OK
494			AH LN RD M 6.2	AH LN RD M 6.1	0	1	H			28.00		28.00	2.442	2.525	3.17	3.17	2.25	0.082	0.000	0.082	11	200	203	DWC	-337	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	1.34		1.18	1.10	1.35	OK
495			AH LN RD M 6.1	AH LN RD M 6	1	1	C			30.00		58.00	2.525	2.428	3.39	6.56	2.25	0.171	0.000	0.171	15	200	203	DWC	309	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.18		1.01	1.35	1.42	OK
496			AH LN RD M 6	AH LN RD M 7	2	1	J			30.00		239.38	2.428	2.285	3.39	27.07	2.25	0.705	0.000	0.705	30	200	203	DWC	210	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	1.01	1.010	0.95	1.42	1.34	OK
497			AH LN RD M 7	AH LN RD M 8	1	1	C			30.00		269.38	2.285	2.294	3.39	30.47	2.25	0.793	0.000	0.793	32	200	203	DWC	-3333	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.95		0.89	1.34	1.40	OK
498			AH LN RD M 8	AH LN RD M 9	1	1	C			30.00		299.38	2.294	2.345	3.39	33.86	2.25	0.882	0.000	0.882	34	200	203	DWC	-588	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	0.89		0.83	1.40	1.52	OK
499			AH LN RD M 9	AH LN RD M 10	1	1	C			30.00		329.38	2.345	2.433	3.39	37.25	2.25	0.970	0.000	0.970	36	200	203	DWC	-341	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	0.83		0.77	1.52	1.66	OK
500			AH LN RD M 10	AH LN RD M 11	2	1	J			20.00		5028.48	2.433	2.006	2.26	568.73	2.25	14.811	0.000	14.811	138	200	203	DWC	47	520	0.010	0.60	18.73	0.79	1.10	0.67	OK	0.65	OK	0.04	0.00	-1.12	-1.120	-1.16	3.55	3.17	OK
501			AH LN RD M 11	AH LN RD M 12	1	1	C			17.00		5045.48	2.006	1.851	1.92	570.65	2.25	14.861	0.000	14.861	138	200	203	DWC	110	520	0.010	0.60	18.73	0.79	1.10	0.67	OK	0.65	OK	0.03	0.00	-1.16		-1.19	3.17	3.04	OK
502			AH LN RD M 12	AH LN RD M 13	1	1	C			25.00		5070.48	1.851	1.800	2.83	573.48	2.25	14.934	0.000	14.934	138	200	203	DWC	490	520	0.010	0.60	18.73	0.80	1.11	0.68	OK	0.66	OK	0.05	0.00	-1.19		-1.24	3.04	3.04	OK
503			AH LN RD M 13	AH LN RD M 14	1	1	C			30.00		5100.48	1.800	1.683	3.39	576.87	2.25	15.023	0.000	15.023	139	200	203	DWC	256	520	0.010	0.60	18.73	0.80	1.11	0.68	OK	0.66	OK	0.06	0.00	-1.24		-1.30	3.04	2.98	OK
504			AH LN RD M 14	AH LN RD M 15	1	1	C			30.00		5130.48	1.683	1.707	3.39	580.27	2.25	15.111	0.000	15.111	139	200	203	DWC	-1250	520	0.010	0.60	18.73	0.81	1.11	0.68	OK	0.66	OK	0.06	0.00	-1.30		-1.36	2.98	3.07	OK
505			AH LN RD M 15	AH LN RD M 16	1	1	C			20.00		5150.48	1.707	1.624	2.26	582.53	2.25	15.170	0.000	15.170	140	200	203	DWC	241	520	0.010	0.60	18.73	0.81	1.11	0.68	OK	0.66	OK	0.04	0.00	-1.36		-1.40	3.07	3.02	OK
506			AH LN RD M 16	AH LN RD M 17	1	1	C			22.00		5172.48	1.624	1.570	2.49	585.02	2.25	15.235	0.000	15.235	140	200	203	DWC	407	520	0.010	0.60	18.73	0.81	1.11	0.68	OK	0.66	OK	0.04	0.00	-1.40		-1.44	3.02	3.01	OK
507			AH LN RD M 17	AH LN RD M 18	1	1	C			33.00		5205.48	1.570	1.706	3.73	588.75	2.25	15.332	0.000	15.332	140	200	203	DWC	-243	520	0.010	0.60	18.73	0.82	1.11	0.69	OK	0.66	OK	0.06	0.00	-1.44		-1.50	3.01	3.21	OK
508			AH LN RD M 21	AH LN RD M 20	0	1	H			30.00		30.00	1.960	1.786	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	172	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	0.86		0.68	1.10	1.11	OK
509			AH LN RD M 20	AH LN RD M 19	1	1	C			30.00		60.00	1.786	1.746	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	750	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.68		0.51	1.11	1.24	OK
510			AH LN RD M 19	AH LN RD M 18	1	1	C			30.00		90.00	1.746	1.706	3.39	10.18	2.25	0.265	0.000	0.265	19	200	203	DWC	750	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.51		0.34	1.24	1.37	OK
511			AH LN RD M 18	AH LN RD M 18.1	2	1	J			29.00		5324.48	1.706	1.734	3.28	602.21	2.25	15.683	0.000	15.683	142	200	203	DWC	-1036	520	0.010	0.60	18.73	0.84	1.12	0.70	OK	0.67	OK	0.06	0.00	-1.50	-1.500	-1.56	3.21	3.29	OK
512			AH LN RD M 18.1	AH LN RD M 18.2	1	1	C			30.00		5354.48	1.734	1.762	3.39	605.60	2.25	15.771	0.000	15.771	142	200	203	DWC	-1071	520	0.010	0.60	18.73	0.84	1.12	0.70	OK	0.67	OK	0.06	0.00	-1.56		-1.62	3.29	3.38	OK
513			AH LN RD M 18.2	AH LN RD M 18.3	1	1	C			30.00		5384.48	1.762	1.771	3.39	609.00	2.25	15.859	0.000	15.859	143	250	253	DWC	-3333	700	0.010	0.60	29.28	0.54	1.02	0.53	OK	0.61	OK	0.04	0.00	-1.62		-1.66	3.38	3.43	OK
514			AH LN RD M 18.3	AH LN RD M 18.4L	1	0	C	L		30.00		5414.48	1.771	1.794	3.39	612.39	2.25	15.948	0.000	15.948	143	250	253	DWC	-1304	700	0.010	0.60	29.28	0.54	1.02	0.53	OK	0.61	OK	0.04	0.00	-1.66		-1.70	3.43	3.49	OK
515			AH LN RD M 18.4	VPY L M14	0	1	H			30.00	5414.48	5444.48	1.794	1.817	3.39	615.78	2.25	16.036	0.000	16.036	143	250	253	DWC	-1304	700	0.010	0.60	29.28	0.55	1.02	0.53	OK	0.61	OK	0.04	0.00	0.64		0.60	1.15	1.22	OK
516			VPY L M14	VPY L M15	2	1	J			17.3																																	

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW+UAC	Total Flow		ID	OD				Manning's n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s			Check Velocity (> 0.3m/s)	From		To	Starting Manhole		Ending manhole
554			ST RD M8	ST RD M8.1A	2	1	J		30.00		276.00	2.438	2.512	3.39	31.22	2.25	0.813	0.000	0.813	33	200	203	DWC	-405	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.43	0.430	0.37	2.01	2.14	OK
555			ST RD M8.1A	ST RD M8.2	1	1	C		25.00		301.00	2.512	2.587	2.83	34.04	2.25	0.887	0.000	0.887	34	200	203	DWC	-333	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	0.37		0.32	2.14	2.27	OK
556			ST RD M8.2	ST RD M8.3	2	1	J		30.00		788.00	2.587	2.786	3.39	89.12	2.25	2.321	0.000	2.321	55	200	203	DWC	-151	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	0.06	0.060	0.00	2.53	2.79	OK
557			ST RD M8.3	ST RD M8.4	1	1	C		30.00		818.00	2.786	2.821	3.39	92.52	2.25	2.409	0.000	2.409	56	200	203	DWC	-857	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.06	0.00	0.00		-0.06	2.79	2.88	OK
558			ST RD M8.4	ST RD M8.5	1	1	C		30.00		848.00	2.821	2.874	3.39	95.91	2.25	2.498	0.000	2.498	57	200	203	DWC	-566	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.06	0.00	-0.06		-0.12	2.88	2.99	OK
559			ST RD M8.5	ST RD M8.6	1	1	C		23.00		871.00	2.874	2.876	2.60	98.51	2.25	2.565	0.000	2.565	58	200	203	DWC	-11500	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.04	0.00	-0.12		-0.16	2.99	3.04	OK
560			SB RD M1	SB RD M2	0	1	H		30.00		30.00	2.454	2.128	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	92	92	0.010	1.41	44.54	0.00	0.30	0.07	OK	0.42	OK	0.33	0.00	1.35		1.02	1.10	1.11	OK
561			SB RD M2	SB RD M3	1	1	C		30.00		60.00	2.128	1.979	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	201	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.02		0.85	1.11	1.13	OK
562			SB RD M3	SB RD M4	1	1	C		30.00		90.00	1.979	1.930	3.39	10.18	2.25	0.265	0.000	0.265	19	200	203	DWC	612	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.85		0.68	1.13	1.25	OK
563			SB RD M4	SB RD M5	1	1	C		20.00		110.00	1.930	1.813	2.26	12.44	2.25	0.324	0.000	0.324	21	200	203	DWC	171	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.68		0.57	1.25	1.24	OK
564			KT Ln RD M1	KT Ln RD M2	0	1	H		22.00		22.00	3.274	3.031	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	91	91	0.010	1.42	44.79	0.00	0.30	0.07	OK	0.43	OK	0.24	0.00	2.17		1.93	1.10	1.10	OK
565			KT Ln RD M2	KT Ln RD M3	1	1	C		30.00		52.00	3.031	2.490	3.39	5.88	2.25	0.153	0.000	0.153	14	200	203	DWC	55	55	0.010	1.83	57.61	0.00	0.30	0.07	OK	0.55	OK	0.55	0.00	1.93		1.38	1.10	1.11	OK
566			KT Ln RD M3	KT Ln RD M4	1	1	C		22.00		74.00	2.490	2.349	2.49	8.37	2.25	0.218	0.000	0.218	17	200	203	DWC	156	156	0.010	1.09	34.21	0.01	0.30	0.07	OK	0.33	OK	0.14	0.00	1.38		1.24	1.11	1.11	OK
567			KT Ln RD M4	KT Ln RD M5	1	1	C		30.00		104.00	2.349	2.127	3.39	11.76	2.25	0.306	0.000	0.306	20	200	203	DWC	135	135	0.010	1.17	36.77	0.01	0.30	0.07	OK	0.35	OK	0.22	0.00	1.24		1.02	1.11	1.11	OK
568			KT Ln RD M9	KT Ln RD M8	0	1	H		35.00		35.00	2.821	2.511	3.96	3.96	2.25	0.103	0.000	0.103	12	200	203	DWC	113	112	0.010	1.28	40.37	0.00	0.30	0.07	OK	0.38	OK	0.31	0.00	1.72		1.41	1.10	1.10	OK
569			KT Ln RD M8	KT Ln RD M7	1	1	C		30.00		65.00	2.511	2.339	3.39	7.35	2.25	0.191	0.000	0.191	16	200	203	DWC	174	170	0.010	1.04	32.77	0.01	0.30	0.07	OK	0.31	OK	0.18	0.00	1.41		1.23	1.10	1.11	OK
570			KT Ln RD M7	KT Ln RD M6	1	1	C		30.00		95.00	2.339	2.194	3.39	10.74	2.25	0.280	0.000	0.280	19	200	203	DWC	207	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.23		1.06	1.11	1.13	OK
571			KT Ln RD M6	KT Ln RD M5	1	1	C		28.00		123.00	2.194	2.124	3.17	13.91	2.25	0.362	0.000	0.362	22	200	203	DWC	400	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	1.06		0.90	1.13	1.22	OK
572			KT Ln RD M5	KT Ln RD M5.1	2	1	J		16.00		243.00	2.124	1.960	1.81	27.48	2.25	0.716	0.000	0.716	31	200	203	DWC	98	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.04	0.00	0.90	0.900	0.86	1.22	1.10	OK
573			KT Ln RD M5.1	SB RD M5	1	1	C		30.00		273.00	1.960	1.813	3.39	30.88	2.25	0.804	0.000	0.804	33	200	203	DWC	204	205	0.010	0.95	29.84	0.03	0.46	0.13	OK	0.44	OK	0.15	0.00	0.86		0.71	1.10	1.10	OK
574			SB RD M5	SB RD M6	2	1	J		30.00		413.00	1.813	1.811	3.39	46.71	2.25	1.216	0.000	1.216	40	200	203	DWC	15000	520	0.010	0.60	18.73	0.06	0.55												

Sl. No.	Road	Element	Man Holes										FLOWS LPS					Proposed Size of Sewer in mm					As per Manning Table			At Ultimate peak flow								Invert Level in m			Depth of cutting in m		Check Depth of cutting			
			From	To			Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day		Peak Factor	Cum Peak Factor	GW+UAC	Total Flow	Required dia.	ID	OD	MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	Manning's n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)	Fall m	Manhole Drop m	From	To	Starting Manhole	Ending manhole	
624			BNKRDM6.1	BNKRDM6	0	1	H		30.00		30.00	4.024	3.934	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	333	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.92		2.75	1.10	1.18	OK
625			BNKRDM6	BNKRDM5	2	1	J		21.00		330.00	3.934	3.868	2.38	37.32	2.25	0.972	0.000	0.972	36	200	203	DWC	318	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	1.97	1.970	1.93	1.96	1.94	OK
626			BNKRDM5.1	BNKRDM5	0	1	H		25.00		25.00	3.874	3.868	2.83	2.83	2.25	0.074	0.000	0.074	10	200	203	DWC	4167	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.77		2.63	1.10	1.24	OK
627			BNKRDM5	BNKRDM4	2	1	J		15.00		370.00	3.868	3.855	1.70	41.85	2.25	1.090	0.000	1.090	38	200	203	DWC	1154	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.03	0.00	1.93	1.930	1.90	1.94	1.96	OK
628			BNKRDM4	BNKRDM3	1	1	C		30.00		400.00	3.855	3.775	3.39	45.24	2.25	1.178	0.000	1.178	39	200	203	DWC	375	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	1.90		1.84	1.96	1.94	OK
629			BNKRDM3	BNKRDM3.1	2	1	J		30.00		472.00	3.775	3.570	3.39	53.38	2.25	1.390	0.000	1.390	43	200	203	DWC	146	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	1.84	1.840	1.78	1.94	1.79	OK
630			BNKRDM3.1	BNKRDM3.2	1	1	C		30.00		502.00	3.570	3.474	3.39	56.78	2.25	1.479	0.000	1.479	44	200	203	DWC	313	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	1.78		1.72	1.79	1.75	OK
631			BNKRDM3.2	BNKRDM3.3	1	1	C		30.00		532.00	3.474	3.487	3.39	60.17	2.25	1.567	0.000	1.567	45	200	203	DWC	-2308	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	1.72		1.66	1.75	1.83	OK
632			BNKRDM3.3	PON RD M 4	1	1	C		33.00		565.00	3.487	3.466	3.73	63.90	2.25	1.664	0.000	1.664	47	200	203	DWC	1571	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	1.66		1.60	1.83	1.87	OK
633			PON RD M 1	PON-PONLN RD M 2	0	1	H		33.00		33.00	3.544	3.551	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	-4714	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.18	0.00	2.44		2.26	1.10	1.29	OK
634			PON-PONLN RD M 2	PON RD M 3	1	1	C		30.00		63.00	3.551	3.415	3.39	7.13	2.25	0.186	0.000	0.186	16	200	203	DWC	221	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.26		2.09	1.29	1.33	OK
635			PON RD M 3	PON RD M 4	1	1	C		34.00		97.00	3.415	3.464	3.85	10.97	2.25	0.286	0.000	0.286	20	200	203	DWC	-694	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	2.09		1.90	1.33	1.56	OK
636			PON RD M 4	PON RD M 5	2	1	J		30.00		692.00	3.464	3.457	3.39	78.27	2.25	2.038	0.000	2.038	51	200	203	DWC	4286	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	1.60	1.600	1.54	1.86	1.92	OK
637			PON RD M 5	PON RD M 6	1	1	C		23.00		715.00	3.457	3.508	2.60	80.87	2.25	2.106	0.000	2.106	52	200	203	DWC	-451	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.04	0.00	1.54		1.50	1.92	2.01	OK
638			PON RD M 6.2	PON RD M 6.1	0	1	H		30.00		30.00	3.684	3.556	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	234	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.58		2.41	1.10	1.15	OK
639			PON RD M 6.1	PON RD M 6	1	1	C		30.00		60.00	3.556	3.508	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	625	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.41		2.24	1.15	1.27	OK
640			PON RD M 6.5	PON RD M 6.4	0	1	H		18.00		18.00	3.604	3.578	2.04	2.04	2.25	0.053	0.000	0.053	9	200	203	DWC	692	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	2.50		2.40	1.10	1.18	OK
641			PON RD M 6.4	PON RD M 6.3	1	1	C		30.00		48.00	3.578	3.554	3.39	5.43	2.25	0.141	0.000	0.141	14	200	203	DWC	1250	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.40		2.23	1.18	1.32	OK
642			PON RD M 6.3	PON RD M 6	1	1	C		30.00		78.00	3.554	3.508	3.39	8.82	2.25	0.230	0.000	0.230	18	200	203	DWC	652	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.23		2.06	1.32	1.45	OK
643			PON RD M 6	PON RD M 7	3	1	J		29.00		882.00	3.508	3.456	3.28	99.76	2.25	2.598	0.000	2.598	58	200	203	DWC	558	180	0.010	1.01	31.84	0.08	0.61	0.20	OK	0.62	OK	0.16	0.00	1.50	1.500	1.34	2.01	2.12	OK
644			PON RD M 7	PON RD M 8	1	1	C		30.00		912.00	3.456	3.442	3.39	103.15	2.25	2.686	0.000	2.686	59	200	203	DWC	2143	180	0.010	1.01	31.84	0.08	0.61	0.20	OK	0.62	OK	0.17	0.00	1.34		1.17	2.12	2.27	OK
645			PON RD M 8	PON RD M 9	1	1	C		30.00		942.00	3.442	3.904	3.39	106.54	2.25	2.775	0.000	2.775	60	200	203	DWC	-65	180	0.010	1.01	31.84	0.09	0.63	0.21	OK	0.64	OK	0.17	0.00	1.17		1.00	2.27	2.90	OK
646			PON RD M 9.1	PON RD M 9.2	0	1	H		39.00		39.00	3.904	3.809	4.41	4.41	2.25	0.115	0.000	0.115	13	200	203	DWC	411	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.22	0.00	2.80		2.58	1.10	1.23	OK
647			PON RD M 9.2	PON RD M 9.3	1	1	C		38.00		77.00	3.809	3.714	4.30	8.71	2.25	0.227	0.000	0.227	17	200	203	DWC	400	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.21	0.00	2.58		2.37	1.23	1.34	OK
648			PON RD M 9.3	PON RD M 9.4	1	1	C		28.00		105.00	3.714	3.694	3.17	11.88	2.25	0.309	0.000	0.309	20	200	203	DWC	1400	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.16	0.00	2.37		2.21	1.34	1.48	OK
649			PON RD M 9.4	PON RD M 9.5	1	1	C		30.00		135.00	3.694	3.659	3.39	15.27	2.25	0.398	0.000	0.398	23	200	203	DWC	857	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.21		2.04	1.48	1.62	OK
650			PON RD M 9.5	PON RD M 9	1	1	C		30.00		165.00	3.659	3.427	3.39	18.66	2.25	0.486	0.000	0.486	25	200	203	DWC	129	180	0.010	1.01	31.84	0.02	0.40	0.10	OK	0.40	OK	0.17	0.00	2.04		1.87	1.62	1.56	OK
651			PON RD M 9	PON RD M 10	2	1	J		30.00		1137.00	3.427	3.263	3.39	128.60	2.25	3.349	0.000	3.349	66	200	203	DWC	183	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.06	0.00	1.00	1.000	0.94	2.43	2.32	OK
652			PON RD M 10	PON RD M 11	1	1	C		30.00		1167.00	3.263	3.239	3.39	131.99	2.25	3.437	0.000	3.437	67	200	203	DWC	1250	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.06	0.00	0.94		0.88	2.32	2.36	OK
653			PON RD M 11	PON RD M 12	1	1	C		30.00		1197.00	3.239	3.201	3.39	135.38	2.25	3.526	0.000	3.526	68	200	203	DWC	789	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.06	0.00	0.88		0.82	2.36	2.38	OK
654			PON RD M 12	PON RD M 13	1	1	C		25.00		1222.00	3.201	3.170	2.83	138.21	2.25	3.599	0.000	3.599	68	200	203	DWC	806	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.05	0.00	0.82		0.77	2.38	2.40	OK
655			PON RD M 13	PON RD M 14	1	1	C		16.00		1238.00	3.170	3.179	1.81	140.02	2.25	3.646	0.000	3.646	69	200	203	DWC	-1778	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.03	0.00	0.77		0.74	2.40	2.44	OK
656			GYM RD M5	GYM RD M4	0	1	H		30.00		30.00	3.790	3.524	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	113	113	0.010	1.28	40.19	0.00	0.30	0.07	OK	0.38	OK	0.27	0.00	2.69		2.42	1.10	1.10	OK
657																																										

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow				Check Velocity (> 0.3m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)				Actual Velocity (v1) m/s	From	To	Starting Manhole	Ending manhole		
694			PON RD M 12.1	PON RD M 12.2	0	1	H		31.00		31.00	3.192	3.184	3.51	3.51	2.25	0.091	0.000	0.091	11	200	203	DWC	3875	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.09		1.92	1.10	1.26	OK
695			PON RD M 12.2	PON RD M 12.3	1	1	C		20.00		51.00	3.184	3.162	2.26	5.77	2.25	0.150	0.000	0.150	14	200	203	DWC	909	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.92		1.81	1.26	1.35	OK
696			PON RD M 12.3	PON RD M 12.4	1	1	C		30.00		81.00	3.162	3.092	3.39	9.16	2.25	0.239	0.000	0.239	18	200	203	DWC	429	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.81		1.64	1.35	1.45	OK
697			PON RD M 12.4	PON RD M 12.5	1	1	C		30.00		111.00	3.092	3.022	3.39	12.55	2.25	0.327	0.000	0.327	21	200	203	DWC	429	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.64		1.47	1.45	1.55	OK
698			PON RD M 12.5	PONLN RD M 17	1	1	C		21.00		132.00	3.022	2.964	2.38	14.93	2.25	0.389	0.000	0.389	23	200	203	DWC	362	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	1.47		1.35	1.55	1.61	OK
699			PONLN RD M 17	PONLN RD M 18	2	1	J		30.00		697.00	2.964	3.050	3.39	78.83	2.25	2.053	0.000	2.053	52	200	203	DWC	-349	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	0.97	0.970	0.91	1.99	2.14	OK
700			PONLN RD M 18	PONLN RD M 19	1	1	C		30.00		727.00	3.050	3.222	3.39	82.23	2.25	2.141	0.000	2.141	53	200	203	DWC	-174	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	0.91		0.85	2.14	2.37	OK
701			PONLN RD M 19	PONLN RD M 20	1	1	C		30.00		757.00	3.222	3.267	3.39	85.62	2.25	2.230	0.000	2.230	54	200	203	DWC	-667	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.06	0.00	0.85		0.79	2.37	2.48	OK
702			PONLN RD M 20	PLP-PONLN RD M5	1	1	C		24.00		781.00	3.267	3.295	2.71	88.33	2.25	2.300	0.000	2.300	55	200	203	DWC	-857	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.05	0.00	0.79		0.74	2.48	2.56	OK
703			PLP-PONLN RD M5	PLP RD M6	2	1	J		30.00		2488.00	2.840	3.067	3.39	281.40	2.25	7.328	0.000	7.328	97	200	203	DWC	-132	520	0.010	0.60	18.73	0.39	0.94	0.44	OK	0.56	OK	0.06	0.00	0.39	0.390	0.33	2.45	2.74	OK
704			PLP RD M6	PLP RD M7	1	1	C		30.00		2518.00	2.840	2.840	3.39	284.79	2.25	7.416	0.000	7.416	98	200	203	DWC	0	520	0.010	0.60	18.73	0.40	0.94	0.44	OK	0.56	OK	0.06	0.00	0.33		0.27	2.51	2.57	OK
705			PLP RD M7	PLP RD M8	1	1	C		16.00		2534.00	2.840	2.698	1.81	286.60	2.25	7.464	0.000	7.464	98	200	203	DWC	113	520	0.010	0.60	18.73	0.40	0.94	0.44	OK	0.56	OK	0.03	0.00	0.27		0.24	2.57	2.46	OK
706			PLP RD M19	PLP RD M18	0	1	H		20.00		20.00	1.924	1.927	2.26	2.26	2.25	0.059	0.000	0.059	9	200	203	DWC	-6667	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	0.82		0.71	1.10	1.22	OK
707			PLP RD M18	PLP RD M17	1	1	C		12.00		32.00	1.927	1.998	1.36	3.62	2.25	0.094	0.000	0.094	11	200	203	DWC	-169	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	0.71		0.64	1.22	1.36	OK
708			PLP RD M17	PLP RD M16	1	1	C		18.00		50.00	1.998	2.093	2.04	5.66	2.25	0.147	0.000	0.147	14	200	203	DWC	-189	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	0.64		0.54	1.36	1.55	OK
709			PLP RD M16	PLP RD M15	1	1	C		30.00		80.00	2.093	2.184	3.39	9.05	2.25	0.236	0.000	0.236	18	200	203	DWC	-330	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.54		0.37	1.55	1.81	OK
710			PLP RD M15	PLP RD M14	1	1	C		30.00		110.00	2.184	2.174	3.39	12.44	2.25	0.324	0.000	0.324	21	200	203	DWC	3000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.37		0.20	1.81	1.97	OK
711			PLP RD M14	PLP RD M13	1	1	C		30.00		140.00	2.174	2.324	3.39	15.83	2.25	0.412	0.000	0.412	23	200	203	DWC	-200	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.20		0.03	1.97	2.29	OK
712			PLP RD M13	PLP RD M12	1	1	C		30.00		170.00	2.324	2.334	3.39	19.23	2.25	0.501	0.000	0.501	26	200	203	DWC	-3000	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.03		-0.06	2.29	2.39	OK
713			PLP RD M12	PLP RD M11	1	1	C		30.00		200.00	2.334	3.388	3.39	22.62	2.25	0.589	0.000	0.589	28	200	203	DWC	-28	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	-0.06		-0.13	2.39	3.52	OK
714			PLP RD M11.2	PLP RD M11.1	0	1	H		26.00		26.00	2.211	2.799	2.94	2.94	2.25	0.077	0.000	0.077	10	200	203	DWC	-44	180	0.010																

Sl. No.	Road	Element	Man Holes										FLOWS LPS					Proposed Size of Sewer in mm					As per Manning Table			At Ultimate peak flow								Invert Level in m			Depth of cutting in m		Check Depth of cutting			
			From	To			Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day	Peak Factor	Cum Peak Factor	GW+UAC	Total Flow	Required dia.	ID	OD	MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	Manning's n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (>0.3m/s)	Fall m	Manhole Drop m	From		To	Starting Manhole	Ending manhole	
904			SJ RD M 29	SJ RD M 30	2	1	J		13.00		3804.00	2.874	2.957	1.47	430.24	2.25	11.204	0.000	11.204	120	200	203	DWC	-157	520	0.010	0.60	18.73	0.60	1.04	0.56	OK	0.62	OK	0.03	0.00	-0.17	-0.170	-0.20	3.04	3.16	OK
905			SJ RD M 30.6	SJ RD M 30.5	0	1	H		20.00		20.00	2.784	2.821	2.26	2.26	2.25	0.059	0.000	0.059	9	200	203	DWC	-541	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.68		1.57	1.10	1.25	OK
906			SJ RD M 30.5	SJ RD M 30.4	1	1	C		19.00		39.00	2.821	2.855	2.15	4.41	2.25	0.115	0.000	0.115	13	200	203	DWC	-559	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.57		1.46	1.25	1.40	OK
907			SJ RD M 30.4	SJ RD M 30.3	1	1	C		26.00		65.00	2.855	2.871	2.94	7.35	2.25	0.191	0.000	0.191	16	200	203	DWC	-1625	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	1.46		1.32	1.40	1.55	OK
908			SJ RD M 30.3	SJ RD M 30.2	1	1	C		30.00		95.00	2.871	2.894	3.39	10.74	2.25	0.280	0.000	0.280	19	200	203	DWC	-1304	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.32		1.15	1.55	1.74	OK
909			SJ RD M 30.2	SJ RD M 30.1	1	1	C		30.00		125.00	2.894	2.925	3.39	14.14	2.25	0.368	0.000	0.368	22	200	203	DWC	-968	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.15		0.98	1.74	1.95	OK
910			SJ RD M 30.1	SJ RD M 30	1	1	C		30.00		155.00	2.925	2.957	3.39	17.53	2.25	0.457	0.000	0.457	25	200	203	DWC	-937	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.98		0.81	1.95	2.15	OK
911			SJ RD M 30	SJ RD M 31	2	1	J		30.00		3989.00	2.957	2.631	3.39	451.16	2.25	11.749	0.000	11.749	123	200	203	DWC	92	520	0.010	0.60	18.73	0.63	1.05	0.58	OK	0.62	OK	0.06	0.00	-0.20	-0.200	-0.26	3.16	2.89	OK
912			SJ RD M 31	SJ RD M 32	1	1	C		10.00		3999.00	2.631	2.638	1.13	452.30	2.25	11.779	0.000	11.779	123	200	203	DWC	-1429	520	0.010	0.60	18.73	0.63	1.05	0.58	OK	0.62	OK	0.02	0.00	-0.26		-0.28	2.89	2.92	OK
913			SJ RD M 32.4	SJ RD M 32.3	0	1	H		35.00		35.00	3.194	3.012	3.96	3.96	2.25	0.103	0.000	0.103	12	200	203	DWC	192	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.19	0.00	2.09		1.90	1.10	1.11	OK
914			SJ RD M 32.3	SJ RD M 32.2	1	1	C		10.00		45.00	3.012	2.918	1.13	5.09	2.25	0.133	0.000	0.133	13	200	203	DWC	106	115	0.010	1.27	39.84	0.00	0.30	0.07	OK	0.38	OK	0.09	0.00	1.90		1.81	1.11	1.11	OK
915			SJ RD M 32.2	SJ RD M 32.1	1	1	C		30.00		75.00	2.918	2.778	3.39	8.48	2.25	0.221	0.000	0.221	17	200	203	DWC	214	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.81		1.64	1.11	1.14	OK
916			SJ RD M 32.1	SJ RD M 32	1	1	C		30.00		105.00	2.778	2.638	3.39	11.88	2.25	0.309	0.000	0.309	20	200	203	DWC	214	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.64		1.47	1.14	1.17	OK
917			SJ RD M 32	SJ RD M 33	2	1	J		11.00		4115.00	2.638	2.709	1.24	465.42	2.25	12.120	0.000	12.120	125	200	203	DWC	-155	520	0.010	0.60	18.73	0.65	1.06	0.59	OK	0.63	OK	0.02	0.00	-0.28	-0.280	-0.30	2.92	3.01	OK
918			SJ RD M 33.1	SJ RD M 33.2	0	1	H		12.00		12.00	2.394	2.355	1.36	1.36	2.25	0.035	0.000	0.035	7	200	203	DWC	308	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	1.29		1.22	1.10	1.14	OK
919			SJ RD M 33.2	SJ RD M 33.3	1	1	C		25.00		37.00	2.355	2.313	2.83	4.18	2.25	0.109	0.000	0.109	12	200	203	DWC	595	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	1.22		1.08	1.14	1.23	OK
920			SJ RD M 33.3.1	SJ RD M 33.3	0	1	H		30.00		30.00	2.474	2.313	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	186	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.37		1.20	1.10	1.11	OK
921			SJ RD M 33.3	SJ RD M 33.4	2	1	J		32.00		99.00	2.360	2.594	3.62	11.20	2.25	0.292	0.000	0.292	20	200	203	DWC	-137	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	1.08	1.080	0.90	1.28	1.69	OK
922			SJ RD M 33.4	SJ RD M 33	1	1	C		30.00		129.00	2.594	2.709	3.39	14.59	2.25	0.380	0.000	0.380	23	200	203	DWC	-261	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.90		0.73	1.69	1.98	OK
923			SJ RD M 33	SJ RD M 34	2	1	J		27.00		4271.00	2.709	2.774	3.05	483.06	2.25	12.580	0.000	12.580	127	200	203	DWC	-415	520	0.010	0.60	18.73	0.67	1.07	0.60	OK	0.64	OK	0.05	0.00	-0.30	-0.300	-0.35	3.01	3.12	OK
924			SJ RD M 34	SJ RD M 35	1	1	C		30.00		4301.00	2.774	2.826	3.39	486.45	2.25	12.668	0.000	12.668	128	200	203	DWC	-577	520	0.010	0.60	18.73	0.68	1.07	0.61	OK	0.64	OK	0.06	0.00	-0.35		-0.41	3.12	3.24	OK
925			SJ RD M 35	SJ RD M 36	1	1	C		28.00		4329.00	2.830	2.890	3.17	489.62	2.25	12.750	0.000	12.750	128	200	203	DWC	-467	520	0.010	0.60	18.73	0.68	1.07	0.61	OK	0.64	OK	0.05	0.00	-0.41		-0.46	3.24	3.35	OK
926			SBC RD M1	SBC RD M2	0	1	H		32.00		32.00	2.404	2.344	3.62	3.62	2.25	0.094	0.000	0.094	11	200	203	DWC	533	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.18	0.00	1.30		1.12	1.10	1.22	OK
927			SBC RD M2	SBC RD M3	1	1	C		17.00		49.00	2.344	2.279	1.92	5.54	2.25	0.144	0.000	0.144	14	200	203	DWC	262	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	1.12		1.03	1.22	1.25	OK
928			SBC RD M3	SBC RD M4	1	1	C		30.00		79.00	2.279	2.493	3.39	8.94	2.25	0.233	0.000	0.233	18	200	203	DWC	-140	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.03		0.86	1.25	1.63	OK
929			SBC RD M4	SBC RD M5	1	1	C		30.00		109.00	2.493	2.706	3.39	12.33	2.25	0.321	0.000	0.321	21	200	203	DWC	-141	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.86		0.69	1.63	2.02	OK
930			SBC RD M5	SJ RD M 36	1	1	C		30.00		139.00	2.706	2.837	3.39	15.72	2.25	0.409	0.000	0.409	23	200	203	DWC	-229	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.69		0.52	2.02	2.32	OK
931			SJ RD M 36	SJ RD M 37	2	1	J		36.00		4504.00	2.837	2.870	4.07	509.41	2.25	13.266	0.000	13.266	130	200	203	DWC	-1091	520	0.010	0.60	18.73	0.71	1.08	0.63	OK	0.64	OK	0.07	0.00	-0.46	-0.460	-0.53	3.30	3.40	OK
932			VS RD M5	VS RD M4	0	1	H		30.00		30.00	1.992	2.483	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	-61	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.89		0.72	1.10	1.76	OK
933			VS RD M4	VS RD M3	1	1	C		30.00		60.00	2.483	2.774	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	-103	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.72		0.55	1.76	2.22	OK
934			VS RD M3	VS RD M2	1	1	C		30.00		90.00	2.774	3.144	3.39	10.18	2.25	0.265	0.000	0.265	19	200	203	DWC	-81	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.55		0.38	2.22	2.76	OK
935			VS RD M2	VS RD M1	1	1	C		30.00		120.00	3.144	3.238	3.39	13.57	2.25	0.353	0.000	0.353	22	200	203	DWC	-319	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.38		0.21	2.76	3.03	OK
936			VS RD M1	SJ RD M 37	1	1	C		30.00		150.00	3.238	2.870	3.39	16.97	2.25	0.442	0.000	0.442	24	200	203	DWC	82	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK								

Sl. No.	Road	Element	Man Holes			Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting	
			From	To							Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW+UAC	Total Flow		ID	OD				Manning's n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s			Check Velocity (> 0.3m/s)	From	To	Starting Manhole	Ending manhole		
974			SJ RD M 44	SJ RD M 45	2	1	J	6.00		5641.00	2.097	1.963	0.68	638.01	2.25	16.615	0.000	16.615	146	250	253	DWC	45	700	0.010	0.60	29.28	0.57	1.03	0.54	OK	0.61	OK	0.01	0.00	-0.91	-0.910	-0.92	3.01	2.88	OK
975			SJ RD M 57	SJ RD M 56	0	1	H	22.00		22.00	2.883	2.823	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	367	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	1.78		1.66	1.10	1.16	OK
976			SJ RD M 56	SJ RD M 55	1	1	C	20.00		42.00	2.823	2.783	2.26	4.75	2.25	0.124	0.000	0.124	13	200	203	DWC	500	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.66		1.55	1.16	1.23	OK
977			SJ RD M 55.2	SJ RD M 55.1	0	1	H	30.00		30.00	2.624	2.731	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	-280	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.52		1.35	1.10	1.38	OK
978			SJ RD M 55.1	SJ RD M 55	1	1	C	30.00		60.00	2.731	2.783	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	-577	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.35		1.18	1.38	1.60	OK
979			SJ RD M 55	SJ RD M 54	2	1	J	13.00		115.00	2.783	2.764	1.47	13.01	2.25	0.339	0.000	0.339	21	200	203	DWC	684	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	1.18	1.180	1.11	1.60	1.65	OK
980			SJ RD M 54	SJ RD M 53	1	1	C	30.00		145.00	2.764	2.711	3.39	16.40	2.25	0.427	0.000	0.427	24	200	203	DWC	566	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.11		0.94	1.65	1.77	OK
981			SJ RD M 53	SJ RD M 52	1	1	C	30.00		175.00	2.711	2.353	3.39	19.79	2.25	0.515	0.000	0.515	26	200	203	DWC	84	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.94		0.85	1.77	1.50	OK
982			SJ RD M 52.2	SJ RD M 52.1	0	1	H	28.00		28.00	2.030	2.203	3.17	3.17	2.25	0.082	0.000	0.082	11	200	203	DWC	-162	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	0.93		0.77	1.10	1.43	OK
983			SJ RD M 52.1	SJ RD M 52	1	1	C	30.00		58.00	2.203	2.353	3.39	6.56	2.25	0.171	0.000	0.171	15	200	203	DWC	-200	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.77		0.60	1.43	1.75	OK
984			SJ RD M 52	SJ RD M 51	2	1	J	27.00		260.00	2.353	2.320	3.05	29.41	2.25	0.766	0.000	0.766	32	200	203	DWC	818	420	0.010	0.66	20.85	0.04	0.51	0.15	OK	0.34	OK	0.06	0.00	0.60	0.600	0.54	1.75	1.78	OK
985			SJ RD M 51	SJ RD M 50	1	1	C	30.00		290.00	2.320	2.304	3.39	32.80	2.25	0.854	0.000	0.854	33	200	203	DWC	1875	420	0.010	0.66	20.85	0.04	0.51	0.15	OK	0.34	OK	0.07	0.00	0.54		0.47	1.78	1.83	OK
986			SJ RD M 50	SJ RD M 49	1	1	C	30.00		320.00	2.304	2.480	3.39	36.19	2.25	0.943	0.000	0.943	35	200	203	DWC	-170	420	0.010	0.66	20.85	0.05	0.53	0.16	OK	0.35	OK	0.07	0.00	0.47		0.40	1.83	2.08	OK
987			SS RD M4	SS RD M3	0	1	H	16.00		16.00	2.084	2.091	1.81	1.81	2.25	0.047	0.000	0.047	8	200	203	DWC	-2286	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	0.98		0.89	1.10	1.20	OK
988			SS RD M3	SS RD M2	1	1	C	30.00		46.00	2.091	2.312	3.39	5.20	2.25	0.135	0.000	0.135	14	200	203	DWC	-136	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.89		0.72	1.20	1.59	OK
989			SS RD M2	SS RD M1	1	1	C	30.00		76.00	2.312	2.434	3.39	8.60	2.25	0.224	0.000	0.224	17	200	203	DWC	-246	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.72		0.55	1.59	1.88	OK
990			SS RD M1	SJ RD M 49	1	1	C	15.00		91.00	2.434	2.480	1.70	10.29	2.25	0.268	0.000	0.268	19	200	203	DWC	-326	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	0.55		0.47	1.88	2.01	OK
991			SJ RD M 49	SJ RD M 48	2	1	J	14.00		425.00	2.480	2.511	1.58	48.07	2.25	1.252	0.000	1.252	40	200	203	DWC	-452	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.03	0.00	0.40	0.400	0.37	2.08	2.14	OK
992			SJ RD M 48	SJ RD M 47	1	1	C	25.00		450.00	2.511	2.436	2.83	50.90	2.25	1.325	0.000	1.325	42	200	203	DWC	333	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.05	0.00	0.37		0.32	2.14	2.12	OK
993			SJ RD M 47	SJ RD M 46	1	1	C	30.00		480.00	2.436	2.112	3.39	54.29	2.25	1.414	0.000	1.414	43	200	203	DWC	93	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	0.32		0.26	2.12	1.85	OK
994			SJ RD M 46	SJ RD M 45	1	1	C	30.00		510.00	2.112	1.963	3.39	57.68	2.25	1.502	0.000	1.502	44	200	203	DWC	201	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	0.26		0.20	1.85		

SEWER NETWORK DESIGN BLOCK 12 B																																											
Sl. No.	Road	Element	Man Holes				Manh ole Type	MANHOL E TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Check Velocity y (> 0.3m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
												Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocit y (V)/m/s	Discharge (Q) LPS	Discharg e Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0 .75)	Actual Velocity (v1) m/s	From				To	Starting Manhole	Ending manhole			
			From	To																																							
1	2	3	4	5	6	7	8	9	10.00	11	12	13.000	14.000	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	
1			AZD RD M1	AZD RD M2	0	1	H		30.41		30.41	3.701	3.570	3.44	3.44	2.25	0.090	0.000	0.090	11	200	203	DWC	232	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.60		2.43	1.10	1.14	OK	
2			AZD RD M2	AZD RD M3	1	1	C		11.90		42.31	3.570	3.824	1.35	4.79	2.25	0.125	0.000	0.125	13	200	203	DWC	-47	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	2.43		2.36	1.14	1.46	OK	
3			AZD RD M3.2	AZD RD M3.1	0	1	H		30.83		30.83	3.824	3.780	3.49	3.49	2.25	0.091	0.000	0.091	11	200	203	DWC	701	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.72		2.55	1.10	1.23	OK	
4			AZD RD M3.1	AZD RD M3	1	1	C		30.00		60.84	3.780	3.551	3.39	6.88	2.25	0.179	0.000	0.179	16	200	203	DWC	131	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.55		2.38	1.23	1.17	OK	
5			AZD RD M3	AZD RD M4	2	1	J		18.10		121.25	3.551	3.531	2.05	13.71	2.25	0.357	0.000	0.357	22	200	203	DWC	905	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	2.36	2.360	2.26	1.19	1.27	OK	
6			AZD RD M4	AZD RD M5	1	1	C		30.00		151.25	3.531	3.482	3.39	17.11	2.25	0.445	0.000	0.445	24	200	203	DWC	612	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.26		2.09	1.27	1.39	OK	
7			AZD RD M5	AZD RD M6	1	1	C		25.31		176.56	3.482	3.457	2.86	19.97	2.25	0.520	0.000	0.520	26	200	203	DWC	1013	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	2.09		2.01	1.39	1.45	OK	
8			AZD RD M6.1	AZD RD M6	0	1	H		28.72		28.72	3.461	3.457	3.25	3.25	2.25	0.085	0.000	0.085	11	200	203	DWC	7180	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	2.36		2.20	1.10	1.26	OK	
9			AZD RD M6	AZD RD M7	2	1	J		30.00		235.29	3.457	3.483	3.39	26.61	2.25	0.693	0.000	0.693	30	200	203	DWC	-1154	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	2.01	2.010	1.95	1.45	1.53	OK	
10			AZD RD M7	AZD RD M8	1	1	C		13.57		248.86	3.483	3.507	1.54	28.15	2.25	0.733	0.000	0.733	31	200	203	DWC	-566	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.03	0.00	1.95		1.92	1.53	1.59	OK	
11			AZD RD M13	AZD RD M12	0	1	H		30.00		30.00	3.724	3.628	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	313	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.62		2.45	1.10	1.18	OK	
12			AZD RD M12	AZD RD M11	1	1	C		30.00		60.00	3.628	3.717	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	-337	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.45		2.28	1.18	1.44	OK	
13			AZD RD M11.2	AZD RD M11.1	0	1	H		33.48		33.48	4.164	3.938	3.79	3.79	2.25	0.099	0.000	0.099	12	200	203	DWC	148	148	0.010	1.12	35.12	0.00	0.30	0.07	OK	0.33	OK	0.23	0.00	3.06		2.83	1.10	1.11	OK	
14			AZD RD M11.1	AZD RD M11	1	1	C		30.00		63.48	3.938	3.717	3.39	7.18	2.25	0.187	0.000	0.187	16	200	203	DWC	136	136	0.010	1.16	36.63	0.01	0.30	0.07	OK	0.35	OK	0.22	0.00	2.83		2.61	1.11	1.11	OK	
15			AZD RD M11	AZD RD M10	2	1	J		8.00		131.48	3.717	3.701	0.90	14.87	2.25	0.387	0.000	0.387	23	200	203	DWC	500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.04	0.00	2.28	2.280	2.24	1.44	1.46	OK	
16			AZD RD M10.4	AZD RD M10.3	0	1	H		23.46		23.46	3.724	3.715	2.65	2.65	2.25	0.069	0.000	0.069	10	200	203	DWC	2606	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	2.62		2.49	1.10	1.23	OK	
17			AZD RD M10.3	AZD RD M10.2	1	1	C		19.11		42.56	3.715	3.690	2.16	4.81	2.25	0.125	0.000	0.125	13	200	203	DWC	764	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	2.49		2.38	1.23	1.31	OK	
18			AZD RD M10.2	AZD RD M10.1	1	1	C		10.82		53.39	3.690	3.695	1.22	6.04	2.25	0.157	0.000	0.157	15	200	203	DWC	-2165	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	2.38		2.32	1.31	1.38	OK	
19			AZD RD M10.1	AZD RD M10	1	1	C		10.11		63.50	3.695	3.701	1.14	7.18	2.25	0.187	0.000	0.187	16	200	203	DWC	-1685	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.06	0.00	2.32		2.26	1.38	1.44	OK	
20			AZD RD M10	AZD RD M9	2	1	J</																																				

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting	
												Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity y (v)/m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s			Check Velocity y (> 0.3m/s)	From	To	Starting Manhole	Ending manhole		
68			TKTHL RD M3	TKTHL RD M4	1	1	C		12.24		61.46	3.195	3.050	1.38	6.95	2.25	0.181	0.000	0.181	16	200	203	DWC	84	84	0.010	1.48	46.61	0.00	0.30	0.07	OK	0.44	OK	0.15	0.00	2.04		1.89	1.16	1.16	OK
69			TKTHL RD M4	TKTHL RD M5	1	1	C		30.00		91.46	3.050	2.672	3.39	10.34	2.25	0.269	0.000	0.269	19	200	203	DWC	79	79	0.010	1.53	48.07	0.01	0.30	0.07	OK	0.46	OK	0.38	0.00	1.89		1.51	1.16	1.16	OK
70			TKTHL RD M5	TKTHL RD M6	1	1	C		30.91		122.36	2.672	2.311	3.50	13.84	2.25	0.360	0.000	0.360	22	200	203	DWC	86	86	0.010	1.46	46.07	0.01	0.30	0.07	OK	0.44	OK	0.36	0.00	1.51		1.15	1.16	1.16	OK
71			TKTHL RD M6	SHNY RD M18	1	1	C		31.04		153.41	2.311	2.458	3.51	17.35	2.25	0.452	0.000	0.452	24	200	203	DWC	-211	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.15		0.98	1.16	1.48	OK
72			SHNY RD M18	SHNY RD M19	2	1	J		23.12		1853.52	2.458	2.044	2.61	209.64	2.25	5.459	0.000	5.459	84	200	203	DWC	56	520	0.010	0.60	18.73	0.29	0.87	0.38	OK	0.52	OK	0.04	0.00	0.45	0.450	0.41	2.01	1.63	OK
73			SHNY RD M19	SHNY RD M20	1	1	C		27.84		1881.36	2.044	2.019	3.15	212.79	2.25	5.541	0.000	5.541	85	200	203	DWC	1114	520	0.010	0.60	18.73	0.30	0.88	0.38	OK	0.52	OK	0.05	0.00	0.41		0.36	1.63	1.66	OK
74			SHNY RD M20	SHNY RD M21	1	1	C		16.13		1897.49	2.019	2.032	1.82	214.61	2.25	5.589	0.000	5.589	85	200	203	DWC	-1241	520	0.010	0.60	18.73	0.30	0.88	0.38	OK	0.52	OK	0.03	0.00	0.36		0.33	1.66	1.70	OK
75			SHNY RD M21.3	SHNY RD M21.2	0	1	H		34.29		34.29	2.344	2.344	3.88	3.88	2.25	0.101	0.000	0.101	12	200	203	DWC	0	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.19	0.00	1.24		1.05	1.10	1.29	OK
76			SHNY RD M21.2	SHNY RD M21.1	1	1	C		33.63		67.91	2.344	2.288	3.80	7.68	2.25	0.200	0.000	0.200	16	200	203	DWC	600	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	1.05		0.86	1.29	1.43	OK
77			SHNY RD M21.1	SHNY RD M21	1	1	C		22.28		90.20	2.288	2.032	2.52	10.20	2.25	0.266	0.000	0.266	19	200	203	DWC	87	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.12	0.00	0.86		0.74	1.43	1.29	OK
78			SHNY RD M21.5	SHNY RD M21.4	0	1	H		28.02		28.02	2.354	2.061	3.17	3.17	2.25	0.083	0.000	0.083	11	200	203	DWC	96	96	0.010	1.39	43.60	0.00	0.30	0.07	OK	0.42	OK	0.29	0.00	1.25		0.96	1.10	1.10	OK
79			SHNY RD M21.4	SHNY RD M21	1	1	C		34.57		62.58	2.061	2.032	3.91	7.08	2.25	0.184	0.000	0.184	16	200	203	DWC	1192	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	0.96		0.77	1.10	1.26	OK
80			SHNY RD M21	SHNY RD M22	3	1	J		9.75		2060.03	2.032	2.054	1.10	232.99	2.25	6.068	0.000	6.068	88	200	203	DWC	-443	520	0.010	0.60	18.73	0.32	0.89	0.40	OK	0.53	OK	0.02	0.00	0.33	0.330	0.31	1.70	1.74	OK
81			SHNY RD M22	SHNY RD M23	1	1	C		14.46		2074.48	2.054	2.022	1.64	234.63	2.25	6.110	0.000	6.110	89	200	203	DWC	452	520	0.010	0.60	18.73	0.33	0.90	0.40	OK	0.54	OK	0.03	0.00	0.31		0.28	1.74	1.74	OK
82			SHNY RD M23	SHNY RD M24	1	1	C		17.03		2091.51	2.022	2.018	1.93	236.55	2.25	6.160	0.000	6.160	89	200	203	DWC	4257	520	0.010	0.60	18.73	0.33	0.90	0.40	OK	0.54	OK	0.03	0.00	0.28		0.25	1.74	1.77	OK
83			SHNY RD M24	SHNY RD M25	1	1	C		10.34		2101.85	2.018	2.197	1.17	237.72	2.25	6.191	0.000	6.191	89	200	203	DWC	-58	520	0.010	0.60	18.73	0.33	0.90	0.40	OK	0.54	OK	0.02	0.00	0.25		0.23	1.77	1.97	OK
84			SHNY RD M25.2	SHNY RD M25.1	0	1	H		24.41		24.41	2.144	2.168	2.76	2.76	2.25	0.072	0.000	0.072	10	200	203	DWC	-1017	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	1.04		0.90	1.10	1.27	OK
85			SHNY RD M25.1	SHNY RD M25	1	1	C		30.00		54.41	2.168	2.197	3.39	6.15	2.25	0.160	0.000	0.160	15	200	203	DWC	-1034	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.90		0.73	1.27	1.47	OK
86			SHNY RD M25.4	SHNY RD M25.3	0	1	H		25.88		25.88	2.414	2.313	2.93	2.93	2.25	0.076	0.000	0.076	10	200	203	DWC	256	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	1.31		1.17	1.10	1.14	OK
87			SHNY RD M25.3	SHNY RD M25	1	1	C		30.00		55.88	2.313	2.194	3.39	6.32	2.25	0.165	0.000	0.165	15	200	203	DWC	252	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.17		1.00	1.14	1.19	OK
88			SHNY RD M25	SHNY RD M26	3	1																																				

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting	
												Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)/m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s			Check Velocity y (> 0.3m/s)	From		To	Starting Manhole		Ending manhole
138			DRG RD M5	DRG RD M4	2	1	J		25.00		141.75	2.117	2.194	2.83	16.03	2.25	0.418	0.000	0.418	24	200	203	DWC	-325	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	0.80	0.800	0.66	1.32	1.53	OK
139			DRG RD M4	DRG RD M3	1	1	C		14.50		156.25	2.194	2.114	1.64	17.67	2.25	0.460	0.000	0.460	25	200	203	DWC	181	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	0.66		0.58	1.53	1.53	OK
140			DRG RD M3	DRG RD M2	1	1	C		8.26		164.51	2.114	2.099	0.93	18.61	2.25	0.485	0.000	0.485	25	200	203	DWC	551	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.03	0.00	0.58		0.55	1.53	1.55	OK
141			DRG RD M2	DRG RD M1	1	1	C		20.00		184.51	2.099	2.080	2.26	20.87	2.25	0.543	0.000	0.543	27	200	203	DWC	1053	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	0.55		0.50	1.55	1.58	OK
142			DRG RD M1	KKR DR M30	1	1	C		19.26		203.77	2.080	3.066	2.18	23.05	2.25	0.600	0.000	0.600	28	200	203	DWC	-20	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	0.50		0.45	1.58	2.62	OK
143			KKR DR M45	KKR DR M44	0	1	H		11.39		11.39	3.123	3.101	1.29	1.29	2.25	0.034	0.000	0.034	7	200	203	DWC	518	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	2.02		1.96	1.10	1.14	OK
144			KKR DR M44	KKR DR M43	1	1	C		30.00		41.39	3.101	2.901	3.39	4.68	2.25	0.122	0.000	0.122	13	200	203	DWC	150	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.96		1.79	1.14	1.11	OK
145			KKR DR M43	KKR DR M42	1	1	C		34.82		76.21	2.901	2.825	3.94	8.62	2.25	0.224	0.000	0.224	17	200	203	DWC	458	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	1.79		1.60	1.11	1.23	OK
146			KKR DR M42	KKR DR M41	1	1	C		30.00		106.21	2.825	2.618	3.39	12.01	2.25	0.313	0.000	0.313	20	200	203	DWC	145	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.60		1.43	1.23	1.19	OK
147			KKR DR M41	KKR DR M40	1	1	C		37.45		143.66	2.618	2.754	4.24	16.25	2.25	0.423	0.000	0.423	24	200	203	DWC	-275	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.21	0.00	1.43		1.22	1.19	1.53	OK
148			KKR DR M40	KKR DR M39	1	1	C		22.53		166.19	2.754	2.943	2.55	18.80	2.25	0.489	0.000	0.489	25	200	203	DWC	-119	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.07	0.00	1.22		1.15	1.53	1.79	OK
149			KKR DR M39	KKR DR M38	1	1	C		22.54		188.73	2.943	2.926	2.55	21.35	2.25	0.556	0.000	0.556	27	200	203	DWC	1326	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	1.15		1.10	1.79	1.83	OK
150			KKR DR M38	KKR DR M37	1	1	C		30.00		218.73	2.926	2.899	3.39	24.74	2.25	0.644	0.000	0.644	29	200	203	DWC	1111	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	1.10		1.03	1.83	1.87	OK
151			KKR DR M37	KKR DR M36	1	1	C		30.00		248.73	2.899	2.735	3.39	28.13	2.25	0.733	0.000	0.733	31	200	203	DWC	183	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	1.03		0.97	1.87	1.77	OK
152			KKR DR M36	KKR DR M35	1	1	C		30.00		278.73	2.735	2.540	3.39	31.53	2.25	0.821	0.000	0.821	33	200	203	DWC	154	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.97		0.91	1.77	1.63	OK
153			KKR DR M35	KKR DR M34	1	1	C		37.72		316.45	2.540	2.761	4.27	35.79	2.25	0.932	0.000	0.932	35	200	203	DWC	-171	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.07	0.00	0.91		0.84	1.63	1.92	OK
154			KKR DR M34	KKR DR M33	1	1	C		25.73		342.18	2.761	2.666	2.91	38.70	2.25	1.008	0.000	1.008	36	200	203	DWC	271	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	0.84		0.79	1.92	1.88	OK
155			KKR DR M33	KKR DR M32	1	1	C		29.49		371.67	2.666	2.587	3.34	42.04	2.25	1.095	0.000	1.095	38	200	203	DWC	373	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	0.79		0.73	1.88	1.86	OK
156			AZD RD M20	AZD RD M21	0	1	H		10.32		10.32	3.928	3.810	1.17	1.17	2.25	0.030	0.000	0.030	7	200	203	DWC	87	87	0.010	1.46	45.80	0.00	0.30	0.07	OK	0.44	OK	0.12	0.00	2.83		2.71	1.10	1.10	FALSE
157			PVKLMA M5	PVKLMA M4	0	1	H		16.03		16.03	3.833	3.759	1.81	1.81	2.25	0.047	0.000	0.047	8	200	203	DWC	217	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.73		2.64	1.10	1.12	OK
158			PVKLMA M4.1	PVKLMA M4	0																																					

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
												Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity y (> 0.3m/s)			From		To	Starting Manhole	Ending manhole	
			From	To																																						
204			AZD RD M43	AZD RD M44	1	1	C		14.00		1051.98	2.470	2.425	1.58	118.98	2.25	3.098	0.000	3.098	63	200	203	DWC	311	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.03	0.00	1.03		1.00	1.44	1.43	OK
205			AZD RD M44	VTKT RD M12	1	1	C		30.00		1081.98	2.104	2.254	3.39	122.37	2.25	3.187	0.000	3.187	64	200	203	DWC	-200	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.06	0.00	1.00		0.94	1.10	1.31	OK
206			VTKT RD M12	VTKT RD M11	1	1	C		30.00		1111.98	2.122	2.197	3.39	125.77	2.25	3.275	0.000	3.275	65	200	203	DWC	-400	250	0.010	0.86	27.02	0.12	0.69	0.24	OK	0.59	OK	0.12	0.00	0.94		0.82	1.18	1.38	OK
207			VTKT RD M11	VTKT RD M10	1	1	C		30.00		1141.98	1.932	2.054	3.39	129.16	2.25	3.364	0.000	3.364	66	200	203	DWC	-246	300	0.010	0.78	24.67	0.14	0.71	0.26	OK	0.56	OK	0.10	0.00	0.82		0.72	1.11	1.33	OK
208			VTKT RD M10	VTKT RD M9	1	1	C		30.00		1171.98	2.392	1.954	3.39	132.55	2.25	3.452	0.000	3.452	67	200	203	DWC	68	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.06	0.00	0.72		0.66	1.67	1.29	OK
209			VTKT RD M9.3	VTKT RD M9.2	0	1	H		13.90		13.90	2.104	2.057	1.57	1.57	2.25	0.041	0.000	0.041	8	200	203	DWC	296	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	1.00		0.92	1.10	1.14	OK
210			VTKT RD M9.2	VTKT RD M9.1	1	1	C		30.10		44.00	2.057	2.008	3.40	4.98	2.25	0.130	0.000	0.130	13	200	203	DWC	614	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.92		0.75	1.14	1.26	OK
211			VTKT RD M9.1	VTKT RD M9	1	1	C		30.00		74.00	2.008	1.954	3.39	8.37	2.25	0.218	0.000	0.218	17	200	203	DWC	556	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.75		0.58	1.26	1.37	OK
212			VTKT RD M9	VTKT RD M8	2	1	J		7.41		1253.39	1.954	1.870	0.84	141.76	2.25	3.692	0.000	3.692	69	200	203	DWC	88	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.01	0.00	0.58	0.58	0.57	1.37	1.30	OK
213			VTKT RD M8.2	VTKT RD M8.1	0	1	H		25.25		25.25	1.880	1.876	2.86	2.86	2.25	0.074	0.000	0.074	10	200	203	DWC	6313	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.78		0.64	1.10	1.24	OK
214			VTKT RD M8.1	VTKT RD M8	1	1	C		25.00		50.25	1.876	1.870	2.83	5.68	2.25	0.148	0.000	0.148	14	200	203	DWC	4167	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.64		0.50	1.24	1.37	OK
215			VTKT RD M8	VTKT RD M7	2	1	J		25.59		1329.23	1.870	1.923	2.89	150.34	2.25	3.915	0.000	3.915	71	200	203	DWC	-483	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.05	0.00	0.50	0.50	0.45	1.37	1.47	OK
216			VTKT RD M7.1	VTKT RD M7	0	1	H		25.74		25.74	1.934	1.923	2.91	2.91	2.25	0.076	0.000	0.076	10	200	203	DWC	2340	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.83		0.69	1.10	1.23	OK
217			VTKT RD M7	VTKT RD M6	2	1	J		26.00		1380.97	1.923	1.894	2.94	156.19	2.25	4.067	0.000	4.067	72	200	203	DWC	897	520	0.010	0.60	18.73	0.22	0.80	0.33	OK	0.48	OK	0.05	0.00	0.45	0.45	0.40	1.47	1.49	OK
218			VTKT RD M6.1	VTKT RD M6	0	1	H		28.01		28.01	1.924	1.894	3.17	3.17	2.25	0.083	0.000	0.083	11	200	203	DWC	934	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	0.82		0.66	1.10	1.23	OK
219			VTKT RD M6	VTKT RD M5	2	1	J		7.41		1416.39	1.894	1.902	0.84	160.20	2.25	4.172	0.000	4.172	73	200	203	DWC	-926	520	0.010	0.60	18.73	0.22	0.80	0.33	OK	0.48	OK	0.01	0.00	0.40	0.40	0.39	1.49	1.51	OK
220			VTKT RD M5.1	VTKT RD M5	0	1	H		30.00		30.00	2.474	1.902	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	52	52	0.010	1.88	59.25	0.00	0.30	0.07	OK	0.56	OK	0.58	0.00	1.37		0.79	1.10	1.11	OK
221			VTKT RD M5	VTKT RD M4	2	1	J		25.00		1471.39	1.902	2.240	2.83	166.42	2.25	4.334	0.000	4.334	75	200	203	DWC	-74	520	0.010	0.60	18.73	0.23	0.81	0.33	OK	0.48	OK	0.05	0.00	0.39	0.39	0.34	1.51	1.90	OK
222			VTKT RD M4	KKR DR M32	1	1	C		28.00		1499.39	2.240	2.587	3.17	169.58	2.25	4.416	0.000	4.416	76	200	203	DWC	-81	520	0.010	0.60	18.73	0.24	0.83	0.34	OK	0.49	OK	0.05	0.00	0.34		0.29	1.90	2.30	OK
223			KKR DR M32	KKR DR M31	2	1	J		18.32		1889.38	2.587	2.760	2.07	213.69	2.25	5.565	0.000	5.565	85	200	203	DWC	-106	520	0.010	0.60	18.73	0.30	0.88	0.38	OK	0.52	OK	0.04	0.00	0.29	0.29	0.25	2.30	2.51	OK
224			KKR DR M31	KKR DR M30	1	1	C		37.66		192																															

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting	
												Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s			Check Velocity y (> 0.3m/s)	From		To	Starting Manhole		Ending manhole
			From																																							
272			KK RD M48	KK RD M47	1	1	C		30.00		45.75	3.248	3.230	3.39	5.17	2.25	0.135	0.000	0.135	14	200	203	DWC	1667	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.06		1.89	1.19	1.34	OK
273			KK RD M47	KK RD M46	1	1	C		30.00		75.75	3.230	3.073	3.39	8.57	2.25	0.223	0.000	0.223	17	200	203	DWC	191	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.89		1.72	1.34	1.35	OK
274			STFRCH RD M25.1	KK RD M46	0	1	H		29.00		29.00	2.990	3.073	3.28	3.28	2.25	0.085	0.000	0.085	11	200	203	DWC	-349	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	1.89		1.73	1.10	1.34	OK
275			KK RD M46	KK RD M45	2	1	J		27.28		132.03	3.073	2.854	3.09	14.93	2.25	0.389	0.000	0.389	23	200	203	DWC	125	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.15	0.00	1.72	1.720	1.57	1.35	1.28	OK
276			KK RD M45	KK RD M44	1	1	C		30.00		162.03	2.856	2.992	3.39	18.33	2.25	0.477	0.000	0.477	25	200	203	DWC	-221	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.57		1.40	1.29	1.59	OK
277			KK RD M44	KK RD M43	1	1	C		30.00		192.03	2.992	2.801	3.39	21.72	2.25	0.566	0.000	0.566	27	200	203	DWC	157	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	1.40		1.33	1.59	1.47	OK
278			KK RD M43	SFRW RD M1.2	2	1	J		37.94		6919.88	2.801	2.747	4.29	782.65	2.25	20.382	0.000	20.382	162	250	253	DWC	703	700	0.010	0.60	29.28	0.70	1.08	0.62	OK	0.64	OK	0.05	0.00	-0.97	-0.97	-1.02	3.77	3.77	OK
279			SFRW RD M1.2	SFRW RD M1.1	1	1	C		30.00		6949.88	2.747	2.894	3.39	786.05	2.25	20.470	0.000	20.470	162	250	253	DWC	-204	700	0.010	0.60	29.28	0.70	1.08	0.62	OK	0.64	OK	0.04	0.00	-1.02		-1.06	3.77	3.95	OK
280			SFRW RD M1.1	STFRCH RD M22	1	1	C		30.00		6979.88	2.894	2.882	3.39	789.44	2.25	20.558	0.000	20.558	162	250	253	DWC	2500	700	0.010	0.60	29.28	0.70	1.08	0.62	OK	0.64	OK	0.04	0.00	-1.06		-1.10	3.95	3.98	OK
281			STFRCH RD M8.2	STFRCH RD M8.1	0	1	H		25.00		25.00	4.034	3.949	2.83	2.83	2.25	0.074	0.000	0.074	10	200	203	DWC	294	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	2.93		2.79	1.10	1.16	OK
282			STFRCH RD M8.1	STFRCH RD M8	1	1	C		30.00		55.00	3.949	3.797	3.39	6.22	2.25	0.162	0.000	0.162	15	200	203	DWC	197	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.79		2.62	1.16	1.18	OK
283			STFRCH RD M8	STFRCH RD M9	1	1	C		21.00		76.00	3.797	3.550	2.38	8.60	2.25	0.224	0.000	0.224	17	200	203	DWC	85	85	0.010	1.47	46.34	0.00	0.30	0.07	OK	0.44	OK	0.25	0.00	2.62		2.37	1.18	1.18	OK
284			STFRCH RD M9	STFRCH RD M10	1	1	C		43.00		119.00	3.550	3.655	4.86	13.46	2.25	0.350	0.000	0.350	22	200	203	DWC	-410	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.24	0.00	2.37		2.13	1.18	1.53	OK
285			STFRCH RD M10	STFRCH RD M11	1	1	C		7.00		126.00	3.655	3.602	0.79	14.25	2.25	0.371	0.000	0.371	22	200	203	DWC	132	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.04	0.00	2.13		2.09	1.53	1.51	OK
286			STFRCH RD M11.2	STFRCH RD M11.1	0	1	H		33.00		33.00	3.734	3.770	3.73	3.73	2.25	0.097	0.000	0.097	12	200	203	DWC	-917	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.18	0.00	2.63		2.45	1.10	1.32	OK
287			STFRCH RD M11.1	STFRCH RD M11	1	1	C		30.00		63.00	3.770	3.602	3.39	7.13	2.25	0.186	0.000	0.186	16	200	203	DWC	179	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.45		2.28	1.32	1.32	OK
288			STFRCH RD M11	STFRCH RD M12	2	1	J		22.00		211.00	3.602	3.549	2.49	23.86	2.25	0.621	0.000	0.621	29	200	203	DWC	415	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	2.09	2.09	2.04	1.51	1.51	OK
289			STFRCH RD M12	STFRCH RD M13	1	1	C		37.00		248.00	3.549	3.617	4.18	28.05	2.25	0.730	0.000	0.730	31	200	203	DWC	-544	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.07	0.00	2.04		1.97	1.51	1.65	OK
290			STFRCH RD M13.5	STFRCH RD M13.4	0	1	H		28.00		28.00	2.162	2.588	3.17	3.17	2.25	0.082	0.000	0.082	11	200	203	DWC	-66	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	1.06		0.90	1.10	1.69	OK
291			STFRCH RD M13.4	STFRCH RD M13.3	1	1	C		13.00		41.00	2.588	2.718	1.47	4.64	2.25	0.121	0.000	0.121	13	200	203	DWC	-100	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	0.90		0.83	1.69	1.89	OK
292			STFRCH RD M13.3	STFRCH RD M13.2	1	1	C		5.00</																																	

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting	
												Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s			Check Velocity y (> 0.3m/s)	From		To	Starting Manhole		Ending manhole
			From	To																																						
338			FRMNL RD M5	FRMNL RD M4	1	1	C		30.10		354.21	2.169	2.109	3.40	40.06	2.25	1.043	0.000	1.043	37	200	203	DWC	502	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	0.06		0.00	2.11	2.11	OK
339			FRMNL RD M4	FRMNL RD M3	1	1	C		17.26		371.46	2.109	2.174	1.95	42.01	2.25	1.094	0.000	1.094	38	200	203	DWC	-265	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.03	0.00	0.00		-0.03	2.11	2.20	OK
340			FRMNL RD M3	FRMNL RD M2	1	1	C		30.05		401.51	2.174	2.128	3.40	45.41	2.25	1.183	0.000	1.183	39	200	203	DWC	653	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	-0.03		-0.09	2.20	2.22	OK
341			FRMNL RD M2.3	FRMNL RD M2.2	0	1	H		17.23		17.23	2.614	2.525	1.95	1.95	2.25	0.051	0.000	0.051	9	200	203	DWC	194	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	1.51		1.41	1.10	1.12	OK
342			FRMNL RD M2.2	FRMNL RD M2.1	1	1	C		28.59		45.82	2.525	2.411	3.23	5.18	2.25	0.135	0.000	0.135	14	200	203	DWC	251	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	1.41		1.25	1.12	1.16	OK
343			FRMNL RD M2.1	FRMNL RD M2	1	1	C		30.61		76.43	2.411	2.128	3.46	8.64	2.25	0.225	0.000	0.225	17	200	203	DWC	108	135	0.010	1.17	36.77	0.01	0.30	0.07	OK	0.35	OK	0.23	0.00	1.25		1.02	1.16	1.11	OK
344			FRMNL RD M2	FRMNL RD M1	2	1	J		26.74		504.68	2.128	2.456	3.02	57.08	2.25	1.486	0.000	1.486	44	200	203	DWC	-82	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.05	0.00	-0.09	-0.09	-0.14	2.22	2.60	OK
345			FRMNL RD M1	PLPDY RD M3	1	1	C		8.85		513.53	2.456	2.498	1.00	58.08	2.25	1.513	0.000	1.513	44	200	203	DWC	-211	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.02	0.00	-0.14		-0.16	2.60	2.66	OK
346			PLPDY RD M3	PLPDY RD M2	2	1	J		30.00		678.59	2.498	2.756	3.39	76.75	2.25	1.999	0.000	1.999	51	200	203	DWC	-116	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	-0.16	-0.16	-0.22	2.66	2.98	OK
347			PLPDY RD M2	PLPDY RD M1	1	1	C		30.00		708.59	2.756	2.990	3.39	80.14	2.25	2.087	0.000	2.087	52	200	203	DWC	-128	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	-0.22		-0.28	2.98	3.27	OK
348			PLPDY RD M1	STFRCH RD M29	1	1	C		19.00		727.59	2.990	2.970	2.15	82.29	2.25	2.143	0.000	2.143	53	200	203	DWC	950	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.04	0.00	-0.28		-0.32	3.27	3.29	OK
349			KK RD M60	KK RD M59	0	1	H		25.00		25.00	2.270	2.300	2.83	2.83	2.25	0.074	0.000	0.074	10	200	203	DWC	-833	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	1.17		1.03	1.10	1.27	OK
350			KK RD M59	KK RD M58	1	1	C		30.00		55.00	2.300	2.310	3.39	6.22	2.25	0.162	0.000	0.162	15	200	203	DWC	-3000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.03		0.86	1.27	1.45	OK
351			KK RD M58	KK RD M57	1	1	C		27.00		82.00	2.310	2.490	3.05	9.27	2.25	0.242	0.000	0.242	18	200	203	DWC	-150	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.15	0.00	0.86		0.71	1.45	1.78	OK
352			KK RD M57	STFRCH RD M34	1	1	C		30.00		112.00	2.490	2.665	3.39	12.67	2.25	0.330	0.000	0.330	21	200	203	DWC	-171	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.71		0.54	1.78	2.13	OK
353			STFRCH RD M34	STFRCH RD M33	1	1	C		37.00		149.00	2.953	2.788	4.18	16.85	2.25	0.439	0.000	0.439	24	200	203	DWC	224	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.21	0.00	0.54		0.33	2.41	2.46	OK
354			STFRCH RD M33	STFRCH RD M32	1	1	C		29.92		178.92	2.902	2.912	3.38	20.24	2.25	0.527	0.000	0.527	26	200	203	DWC	-2992	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	0.33		0.24	2.57	2.67	OK
355			STFRCH RD M32	STFRCH RD M31	1	1	C		30.00		208.92	2.893	2.898	3.39	23.63	2.25	0.615	0.000	0.615	28	200	203	DWC	-6000	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.24		0.17	2.65	2.73	OK
356			STFRCH RD M31	STFRCH RD M30	1	1	C		30.00		238.92	2.684	2.825	3.39	27.02	2.25	0.704	0.000	0.704	30	200	203	DWC	-213	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.17		0.11	2.51	2.72	OK
357			STFRCH RD M30.3	STFRCH RD M30.2	0	1	H		20.10		20.10	2.920	2.901	2.27	2.27	2.25	0.059	0.000	0.059	9	200	203	DWC	1058	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.82		1.71	1.10	1.19	OK
358			STFRCH RD M30.2	STFRCH RD M30.1	1	1	C		30.00		50.10	2.901																														

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumaltive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From		To	Starting Manhole	Ending manhole	
403			SFRW RD M13	SFRW RD M14	1	1	C		30.00		10195.21	1.880	2.099	3.39	1153.10	2.25	30.029	0.000	30.029	196	300	304	DWC	-137	870	0.010	0.60	42.70	0.70	1.08	0.62	OK	0.65	OK	0.03	0.00	-1.41		-1.44	3.29	3.54	OK
404			SFRW RD M15	SFRW RD M14	0	1	H		40.01		40.01	2.884	2.099	4.53	4.53	2.25	0.118	0.000	0.118	13	200	203	DWC	51	51	0.010	1.90	59.82	0.00	0.30	0.07	OK	0.57	OK	0.78	0.00	1.78		1.00	1.10	1.10	FALSE
405			SFRW RD M14	PF RD M8	2	1	J		16.16		10251.38	2.099	2.138	1.83	1159.45	2.25	30.194	0.000	30.194	197	300	304	DWC	-414	870	0.010	0.60	42.70	0.71	1.08	0.63	OK	0.65	OK	0.02	0.00	-1.44	-1.44	-1.46	3.54	3.60	OK
406			PF RD M8	PF RD M7	1	1	C		30.00		10281.38	2.138	2.224	3.39	1162.85	2.25	30.282	0.000	30.282	197	300	304	DWC	-349	870	0.010	0.60	42.70	0.71	1.08	0.63	OK	0.65	OK	0.03	0.00	-1.46		-1.49	3.60	3.71	OK
407			PF RD M7	PF RD M6	1	1	C		30.00		10311.38	2.224	2.153	3.39	1166.24	2.25	30.371	0.000	30.371	197	300	304	DWC	423	870	0.010	0.60	42.70	0.71	1.08	0.63	OK	0.65	OK	0.03	0.00	-1.49		-1.52	3.71	3.67	OK
408			PF RD M6	PF RD M5	1	1	C		30.00		10341.38	2.153	2.080	3.39	1169.63	2.25	30.459	0.000	30.459	197	300	304	DWC	411	870	0.010	0.60	42.70	0.71	1.08	0.63	OK	0.65	OK	0.03	0.00	-1.52		-1.55	3.67	3.63	OK
409			PF RD M3.1	PF RD M3.2	0	1	H		18.75		18.75	2.124	2.003	2.12	2.12	2.25	0.055	0.000	0.055	9	200	203	DWC	155	155	0.010	1.09	34.32	0.00	0.30	0.07	OK	0.33	OK	0.12	0.00	1.02		0.90	1.10	1.10	OK
410			PF RD M3.2	PF RD M3.3	1	1	C		30.00		48.75	2.003	2.003	3.39	5.51	2.25	0.144	0.000	0.144	14	200	203	DWC	0	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.90		0.73	1.10	1.27	OK
411			PF RD M3.3	PF RD M3.4	1	1	C		33.97		82.72	2.003	2.000	3.84	9.36	2.25	0.244	0.000	0.244	18	200	203	DWC	11323	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	0.73		0.54	1.27	1.46	OK
412			PF RD M3.4	PF RD M3.5	1	1	C		14.82		97.54	2.000	2.014	1.68	11.03	2.25	0.287	0.000	0.287	20	200	203	DWC	-1059	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.08	0.00	0.54		0.46	1.46	1.55	OK
413			PF RD M3.5	PF RD M5	1	1	C		31.44		128.98	2.014	2.080	3.56	14.59	2.25	0.380	0.000	0.380	22	200	203	DWC	-476	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.46		0.29	1.55	1.79	OK
414			PF RD M5	PF RD M4	2	1	J		41.08		10511.44	2.080	2.079	4.65	1188.87	2.25	30.960	0.000	30.960	199	300	304	DWC	41080	870	0.010	0.60	42.70	0.72	1.09	0.63	OK	0.66	OK	0.05	0.00	-1.55	-1.55	-1.60	3.63	3.68	OK
415			PF RD M4	PF RD M3	1	1	C		30.00		10541.44	2.079	2.311	3.39	1192.26	2.25	31.048	0.000	31.048	199	300	304	DWC	-129	870	0.010	0.60	42.70	0.73	1.09	0.64	OK	0.66	OK	0.03	0.00	-1.60		-1.63	3.68	3.94	OK
416			PF RD M3	PF RD M2	1	1	C		30.00		10571.44	2.311	2.202	3.39	1195.65	2.25	31.137	0.000	31.137	200	300	304	DWC	275	870	0.010	0.60	42.70	0.73	1.09	0.64	OK	0.66	OK	0.03	0.00	-1.63		-1.66	3.94	3.86	OK
417			PF RD M2	PF RD M1	1	1	C		30.00		10601.44	2.202	2.092	3.39	1199.05	2.25	31.225	0.000	31.225	200	300	304	DWC	273	870	0.010	0.60	42.70	0.73	1.09	0.64	OK	0.66	OK	0.03	0.00	-1.66		-1.69	3.86	3.78	OK
418			PF RD M1	CHMNY L M9	1	1	C		30.59		10632.03	2.092	2.081	3.46	1202.51	2.25	31.315	0.000	31.315	200	300	304	DWC	2781	870	0.010	0.60	42.70	0.73	1.09	0.64	OK	0.66	OK	0.04	0.00	-1.69		-1.73	3.78	3.81	OK
419			CHMNY L M1	CHMNY L M2	0	1	H		30.00		30.00	3.350	3.075	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	109	109	0.010	1.30	40.92	0.00	0.30	0.07	OK	0.39	OK	0.28	0.00	2.25		1.97	1.10	1.11	OK
420			CHMNY L M2	CHMNY L M3	1	1	C		30.00		60.00	3.075	2.826	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	120	120	0.010	1.24	39.00	0.00	0.30	0.07	OK	0.37	OK	0.25	0.00	1.97		1.72	1.11	1.11	OK
421			CHMNY L M3	CHMNY L M4	1	1	C		18.24		78.24	2.826	2.713	2.06	8.85	2.25	0.230	0.000	0.230	18	200	203	DWC	161	161	0.010	1.07	33.67	0.01	0.30	0.07	OK	0.32	OK	0.11	0.00	1.72		1.61	1.11	1.10	OK
422			CHMNY L M4.4	CHMNY L M4.3	0	1	H		21.26		21.26	2.804	2.402	2.40	2.40	2.25	0.063	0.000	0.063	9	200	203	DWC	53	53	0.010	1.86	58.68	0.00	0.30	0.07	OK	0.56	OK	0.40	0.00	1.70		1.30	1.10	1.10	OK
423			CHMNY L M4.3	CHMNY L M4.2	1	1	C		24.03		45.30	2.402	2.550	2.72	5.12	2.25	0.133	0.000	0.133	14	200	203	DWC	-162	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.13	0.00	1.30		1.17	1.10	1.38	OK
424			CHMNY L M4.2	CHMNY L M4.1	1	1	C		20.37		65.66	2.550	2.697	2.30	7.43	2.25	0.193	0.000	0.193	16	200	203	DWC	-139	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.17		1.06	1.38	1.64	OK
425			CHMNY L M4.1	CHMNY L M4	1	1	C		30.00		95.66	2.697	2.713	3.39	10.82	2.25	0.282	0.000	0.282	19	200	203	DWC	-1875	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.06		0.89	1.64	1.82	OK
426			CHMNY L M4	CHMNY L M5	2	1	J		30.00		203.90	2.713	2.661	3.39	23.06	2.25	0.601	0.000	0.601	28	200	203	DWC	577	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.89	0.89	0.82	1.82	1.84	OK
427			CHMNY L M5	CHMNY L M6	1	1	C		30.00		233.90	2.661	2.625	3.39	26.45	2.25	0.689	0.000	0.689	30	200	203	DWC	833	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	0.82		0.75	1.84	1.88	OK
428			CHMNY L M6.4	CHMNY L M6..3	0	1	H		33.74		33.74	2.714	2.612	3.82	3.82	2.25	0.099	0.000	0.099	12	200	203	DWC	331	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.19	0.00	1.61		1.42	1.10	1.19	OK
429			CHMNY L M6..3.1	CHMNY L M6..3	0	1	H		14.70		14.70	2.670	2.612	1.66	1.66	2.25	0.043	0.000	0.043	8	200	203	DWC	253	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	1.57		1.49	1.10	1.12	OK
430			CHMNY L M6..3	CHMNY L M6.2	2	1	J		9.19		57.63	2.612	2.665	1.04	6.52	2.25	0.170	0.000	0.170	15	200	203	DWC	-173	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.05	0.00	1.42	1.42	1.37	1.19	1.30	OK
431			CHMNY L M6.2	CHMNY L M6.1	1	1	C		30.00		87.63	2.665	2.646	3.39	9.91	2.25	0.258	0.000	0.258	19	200	203	DWC	1579	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.37		1.20	1.30	1.45	OK
432			CHMNY L M6.1	CHMNY L M6	1	1	C		20.36		107.98	2.646	2.625	2.30	12.21	2.25	0.318	0.000	0.318	21	200	203	DWC	969	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.20		1.09	1.45	1.54	OK
433			CHMNY L M6	CHMNY L M7	2	1	J		30.00		371.88	2.625	2.597	3.39	42.06	2.25	1.095	0.000	1.095	38	200	203	DWC	1071	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	0.75	0.75	0.69	1.88	1.91	OK
434			CHMNY L M7	CHMNY L M8	1	1	C		30.02		401.90	2.597	2.141	3.40	45.46	2.25	1.184	0.000	1.184	39	200	203	DWC	66	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	0.69		0.63	1.91	1.51	OK
435			CHMNY L M8.2	CHMNY L M8.1	0	1	H		28.18		28.18	2.751	2.382	3.19	3.19	2.25	0.083	0.000	0.083	11	200	203	DWC	76	76	0.010	1.56	49.01	0.00	0.30	0.07	OK	0.47	OK	0.37	0.00						

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity y (> 0.3m/s)			From		To	Starting Manhole	Ending manhole	
468			VACB RD M6	VACB RD M7	2	1	J		37.25		329.42	2.114	2.130	4.21	37.26	2.25	0.970	0.000	0.970	36	200	203	DWC	-2328	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.07	0.00	0.05	-0.05	-0.02	2.06	2.15	OK
469			VACB RD M7.1	VACB RD M7	0	1	H		17.27		17.27	1.794	2.130	1.95	1.95	2.25	0.051	0.000	0.051	9	200	203	DWC	-51	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.10	0.00	0.69		0.59	1.10	1.54	OK
470			VACB RD M7	VACB RD M8	2	1	J		5.39		352.09	2.130	2.140	0.61	39.82	2.25	1.037	0.000	1.037	37	200	203	DWC	-539	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.01	0.00	-0.02	-0.020	-0.03	2.15	2.17	OK
471			VACB RD M8	ANJP RD M7	2	1	J		37.51		813.04	2.140	2.021	4.24	91.96	2.25	2.395	0.000	2.395	56	200	203	DWC	315	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.07	0.00	-0.03	-0.03	-0.10	2.17	2.12	OK
472			ANJP RD M11	ANJP RD M10	0	1	H		25.32		25.32	2.421	2.048	2.86	2.86	2.25	0.075	0.000	0.075	10	200	203	DWC	68	67	0.010	1.66	52.19	0.00	0.30	0.07	OK	0.50	OK	0.38	0.00	1.32		0.94	1.10	1.11	OK
473			ANJP RD M10	ANJP RD M9	1	1	C		40.25		65.57	2.048	2.417	4.55	7.42	2.25	0.193	0.000	0.193	16	200	203	DWC	-109	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.22	0.00	0.94		0.72	1.11	1.70	OK
474			ANJP RD M9	ANJP RD M8	1	1	C		30.93		96.50	2.417	2.081	3.50	10.91	2.25	0.284	0.000	0.284	20	200	203	DWC	92	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.72		0.55	1.70	1.53	OK
475			ANJP RD M8	ANJP RD M7	1	1	C		29.90		126.40	2.081	2.021	3.38	14.30	2.25	0.372	0.000	0.372	22	200	203	DWC	498	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.55		0.38	1.53	1.64	OK
476			ANJP RD M7.2	ANJP RD M7.1	0	1	H		29.22		29.22	2.342	2.242	3.31	3.31	2.25	0.086	0.000	0.086	11	200	203	DWC	292	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	1.24		1.08	1.10	1.16	OK
477			ANJP RD M7.1	ANJP RD M7	1	1	C		30.63		59.85	2.242	2.021	3.46	6.77	2.25	0.176	0.000	0.176	15	200	203	DWC	139	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.08		0.91	1.16	1.11	OK
478			ANJP RD M7	ANJP RD M6	3	1	J		40.21		1039.50	2.021	2.048	4.55	117.57	2.25	3.062	0.000	3.062	63	200	203	DWC	-1489	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.08	0.00	0.38	0.38	0.30	1.64	1.75	OK
479			ANJP RD M6	ANJP RD M5	1	1	C		27.39		1066.89	2.048	1.997	3.10	120.67	2.25	3.142	0.000	3.142	64	200	203	DWC	537	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.05	0.00	0.30		0.25	1.75	1.75	OK
480			ANJP RD M5	ANJP RD M4	1	1	C		30.00		1096.89	1.997	1.979	3.39	124.06	2.25	3.231	0.000	3.231	65	200	203	DWC	1667	520	0.010	0.60	18.73	0.17	0.75	0.29	OK	0.45	OK	0.06	0.00	0.25		0.19	1.75	1.79	OK
481			ANJP RD M4	ANJP RD M3	1	1	C		30.00		1126.89	1.979	2.075	3.39	127.45	2.25	3.319	0.000	3.319	66	200	203	DWC	-313	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.06	0.00	0.19		0.13	1.79	1.95	OK
482			ANJP RD M3.2	ANJP RD M3.1	0	1	H		16.17		16.17	2.334	2.289	1.83	1.83	2.25	0.048	0.000	0.048	8	200	203	DWC	359	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	1.23		1.14	1.10	1.15	OK
483			ANJP RD M3.1	ANJP RD M3	1	1	C		31.08		47.25	2.289	2.075	3.52	5.34	2.25	0.139	0.000	0.139	14	200	203	DWC	145	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.14		0.97	1.15	1.11	OK
484			ANJP RD M3	ANJP RD M2	2	1	J		22.46		1196.60	2.075	2.029	2.54	135.34	2.25	3.524	0.000	3.524	68	200	203	DWC	488	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.04	0.00	0.13	0.13	0.09	1.95	1.94	OK
485			ANJP RD M2	ANJP RD M1	1	1	C		28.80		1225.40	2.029	2.084	3.26	138.60	2.25	3.609	0.000	3.609	68	200	203	DWC	-524	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.06	0.00	0.09		0.03	1.94	2.05	OK
486			ANJP RD M1	PLPDY RD M11	1	1	C		28.63		1254.03	2.084	2.129	3.24	141.83	2.25	3.694	0.000	3.694	69	200	203	DWC	-636	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.06	0.00	0.03		-0.03	2.05	2.16	OK
487			PLPDY RD M7.3	PLPDY RD M7.2	0	1	H		27.58		27.58	2.944	2.924	3.12	3.12	2.25	0.081	0.000	0.081	11	200	203	DWC	1379	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.15	0.00	1.84		1.69	1.10	1.23	OK
488			PLPDY RD M7.2	PLPDY RD M7.1	1	1	C		33.44		61.01	2.924	2.935	3.78	6.90	2.25	0.180	0.000	0.180	16	200	203	DWC	-3040	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	1.69		1.50	1.23	1.44	OK
489			PLPDY RD M7.1	PLPDY RD M7	1	1	C		32.11		93.12	2.935	2.821	3.63	10.53	2.25	0.274	0.000	0.274	19	200	203	DWC	282	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	1.50		1.32	1.44	1.50	OK
490			PLPDY RD M7	PLPDY RD M8	1	1	C		32.94		126.07	2.821	2.562	3.73	14.26	2.25	0.371	0.000	0.371	22	200	203	DWC	127	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.10	0.00	1.32		1.22	1.50	1.34	OK
491			PLPDY RD M8.1	PLPDY RD M8	0	1	H		40.37		40.37	2.732	2.562	4.57	4.57	2.25	0.119	0.000	0.119	13	200	203	DWC	237	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.22	0.00	1.63		1.41	1.10	1.15	OK
492			PLPDY RD M8	PLPDY RD M9	2	1	J		12.69		179.12	2.562	2.485	1.44	20.26	2.25	0.528	0.000	0.528	26	200	203	DWC	165	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.03	0.00	1.22	1.22	1.19	1.34	1.30	OK
493			PLPDY RD M9	PLPDY RD M10	1	1	C		30.00		209.12	2.485	2.129	3.39	23.65	2.25	0.616	0.000	0.616	29	200	203	DWC	84	180	0.010	1.01	31.84	0.02	0.40	0.10	OK	0.40	OK	0.17	0.00	1.19		1.02	1.30	1.11	OK
494			PLPDY RD M10.2	PLPDY RD M10.1	0	1	H		29.71		29.71	2.334	2.395	3.36	3.36	2.25	0.088	0.000	0.088	11	200	203	DWC	-487	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.23		1.06	1.10	1.34	OK
495			PLPDY RD M10.1	PLPDY RD M10	1	1	C		31.05		60.76	2.395	2.129	3.51	6.87	2.25	0.179	0.000	0.179	16	200	203	DWC	117	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.06		0.89	1.34	1.24	OK
496			PLPDY RD M10	PLPDY RD M11	2	1	J		4.87		274.76	2.129	2.095	0.55	31.08	2.25	0.809	0.000	0.809	33	200	203	DWC	143	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.01	0.00	0.89	0.89	0.88	1.24	1.22	OK
497			PLPDY RD M11	PLPDY RD M12	2	1	J		35.00		1563.79	2.095	1.983	3.96	176.87	2.25	4.606	0.000	4.606	77	200	203	DWC	313	520	0.010	0.60	18.73	0.25	0.84	0.35	OK	0.50	OK	0.07	0.00	-0.03	-0.03	-0.10	2.13	2.08	OK
498			PLPDY RD M12.2	PLPDY RD M12.1	0	1	H		15.06		15.06	2.142	2.135	1.70	1.70	2.25	0.044	0.000	0.044	8	200	203	DWC	2151	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	1.04		0.96	1.10	1.18	OK
499			PLPDY RD M12.1	PLPDY RD M12	1	1	C		30.00		45.06	2.135	1.983	3.39	5.10	2.25	0.133	0.000	0.133	14	200	203	DWC	197	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.96		0.79	1.18	1.19	OK
500			PLPDY RD M12	PLPDY RD M13	2	1	J		31.67		1640.51	1.983	2.003	3.58	185.55	2.25	4.832	0.000	4.832	79	200	203	DWC	-1583	520	0.010	0.60	18.73	0.26	0.84	0.35	OK	0.50	OK	0.06	0.00	-0.10	-0.10				

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Check Velocity y (> 0.3m/s)	Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
												Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity y (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s				From		To	Starting Manhole	Ending manhole	
533			LH-P RD M42.4	LH-P RD M42	1	1	C		30.00		90.00	1.924	1.944	3.39	10.18	2.25	0.265	0.000	0.265	19	200	203	DWC	-1500	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.48		0.31	1.44	1.63	OK
534			LH-P RD M42	LH-P RD M41	2	1	J		36.50		239.50	1.944	2.133	4.13	27.09	2.25	0.705	0.000	0.705	30	200	203	DWC	-193	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.09	0.00	0.31	0.31	0.22	1.63	1.91	OK
535			LH-P RD M41.1	LH-P RD M41.2	0	1	H		30.00		30.00	2.264	2.088	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	170	170	0.010	1.04	32.77	0.00	0.30	0.07	OK	0.31	OK	0.18	0.00	1.16		0.98	1.10	1.11	OK
536			LH-P RD M41.2	LH-P RD M41.3	1	1	C		25.00		55.00	2.088	2.106	2.83	6.22	2.25	0.162	0.000	0.162	15	200	203	DWC	-1389	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	0.98		0.84	1.11	1.27	OK
537			LH-P RD M41.3	LH-P RD M41.4	1	1	C		17.36		72.36	2.106	2.240	1.96	8.18	2.25	0.213	0.000	0.213	17	200	203	DWC	-130	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	0.84		0.74	1.27	1.50	OK
538			LH-P RD M41.4	LH-P RD M41.5	1	1	C		29.92		102.28	2.240	2.361	3.38	11.57	2.25	0.301	0.000	0.301	20	200	203	DWC	-247	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.74		0.57	1.50	1.79	OK
539			LH-P RD M41.5	LH-P RD M41	1	1	C		36.00		138.28	2.361	2.133	4.07	15.64	2.25	0.407	0.000	0.407	23	200	203	DWC	158	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.20	0.00	0.57		0.37	1.79	1.76	OK
540			LH-P RD M41	LH-P RD M40	2	1	J		22.27		400.05	2.133	2.070	2.52	45.25	2.25	1.178	0.000	1.178	39	200	203	DWC	353	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	0.22	0.22	0.18	1.91	1.89	OK
541			LH-P RD M40	LH-P RD M39	1	1	C		22.00		422.05	2.070	2.006	2.49	47.73	2.25	1.243	0.000	1.243	40	200	203	DWC	344	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.04	0.00	0.18		0.14	1.89	1.87	OK
542			LH-P RD M39.1	LH-P RD M39.2	0	1	H		33.12		33.12	2.184	2.168	3.75	3.75	2.25	0.098	0.000	0.098	12	200	203	DWC	2070	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.18	0.00	1.08		0.90	1.10	1.27	OK
543			LH-P RD M39.2	LH-P RD M39	1	1	C		37.07		70.18	2.168	2.006	4.19	7.94	2.25	0.207	0.000	0.207	17	200	203	DWC	229	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.21	0.00	0.90		0.69	1.27	1.32	OK
544			LH-P RD M39	LH-P RD M38	2	1	J		10.52		502.75	2.006	2.047	1.19	56.86	2.25	1.481	0.000	1.481	44	200	203	DWC	-256	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.02	0.00	0.14	0.14	0.12	1.87	1.93	OK
545			LH-P RD M38	LH-P RD M37	1	1	C		34.00		536.75	2.047	1.912	3.85	60.71	2.25	1.581	0.000	1.581	45	200	203	DWC	252	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.07	0.00	0.12		0.05	1.93	1.86	OK
546			LH-P RD M37	LH-P RD M36	1	1	C		39.99		576.74	1.912	1.857	4.52	65.23	2.25	1.699	0.000	1.699	47	200	203	DWC	727	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.08	0.00	0.05		-0.03	1.86	1.89	OK
547			LH-P RD M36	LH-P RD M35	1	1	C		29.98		606.72	1.857	1.802	3.39	68.62	2.25	1.787	0.000	1.787	48	200	203	DWC	545	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	-0.03		-0.09	1.89	1.89	OK
548			LH-P RD M35	TP-LHP RD M23	1	1	C		41.50		648.22	1.802	2.919	4.69	73.32	2.25	1.909	0.000	1.909	50	200	203	DWC	-37	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.08	0.00	-0.09		-0.17	1.89	3.09	OK
549			TP-LHP RD M23	KOT RD M39	1	1	C		31.67		679.89	2.919	2.960	3.58	76.90	2.25	2.003	0.000	2.003	51	200	203	DWC	-772	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	-0.17		-0.23	3.09	3.19	OK
550			KOT RD M31	KOT RD M32	0	1	H		20.00		20.00	2.484	2.565	2.26	2.26	2.25	0.059	0.000	0.059	9	200	203	DWC	-247	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.38		1.27	1.10	1.30	OK
551			KOT RD M32	KOT RD M33	1	1	C		30.00		50.00	2.565	2.452	3.39	5.66	2.25	0.147	0.000	0.147	14	200	203	DWC	265	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.27		1.10	1.30	1.35	OK
552			KOT RD M33	KOT RD M34	1	1	C		30.00		80.00	2.452	2.052	3.39	9.05	2.25	0.236	0.000	0.236	18	200	203	DWC	75	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.10		0.93	1.35	1.12	OK
553			KOT RD M34	KOT RD M35	1	1	C		30.00		11																															

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m		Depth of cutting in m		Check Depth of cutting		
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)/m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity y (> 0.3m/s)			From	To	Starting Manhole	Ending manhole		
598			LHP-RD M25	TP RD M14	1	1	C		11.86		231.11	1.920	1.963	1.34	26.14	2.25	0.681	0.000	0.681	30	200	203	DWC	-276	180	0.010	1.01	31.84	0.02	0.40	0.10	OK	0.40	OK	0.07	0.00	-0.05	-0.12	1.97	2.08	OK	
599			TP RD M22	TP RD M21	0	1	H		30.94		30.94	2.704	2.357	3.50	3.50	2.25	0.091	0.000	0.091	11	200	203	DWC	89	89	0.010	1.44	45.29	0.00	0.30	0.07	OK	0.43	OK	0.35	0.00	1.60	1.25	1.10	1.11	OK	
600			TP RD M21	TP RD M20	1	1	C		30.00		60.94	2.357	2.334	3.39	6.89	2.25	0.179	0.000	0.179	16	200	203	DWC	1304	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.25	1.08	1.11	1.25	OK	
601			TP RD M20	TP RD M19	1	1	C		30.00		90.94	2.334	2.291	3.39	10.29	2.25	0.268	0.000	0.268	19	200	203	DWC	698	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.08	0.91	1.25	1.38	OK	
602			TP RD M19	TP RD M18	1	1	C		19.95		110.88	2.291	2.281	2.26	12.54	2.25	0.327	0.000	0.327	21	200	203	DWC	1995	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.91	0.80	1.38	1.48	OK	
603			TP RD M18	TP RD M17	1	1	C		30.00		140.88	2.281	2.098	3.39	15.93	2.25	0.415	0.000	0.415	23	200	203	DWC	164	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.80	0.63	1.48	1.47	OK	
604			TP RD M17	TP RD M16	1	1	C		30.00		170.88	2.098	2.193	3.39	19.33	2.25	0.503	0.000	0.503	26	200	203	DWC	-316	180	0.010	1.01	31.84	0.02	0.40	0.10	OK	0.40	OK	0.17	0.00	0.63	0.46	1.47	1.73	OK	
605			TP RD M16	TP RD M15	1	1	C		30.00		200.88	2.193	1.907	3.39	22.72	2.25	0.592	0.000	0.592	28	200	203	DWC	105	180	0.010	1.01	31.84	0.02	0.40	0.10	OK	0.40	OK	0.17	0.00	0.46	0.29	1.73	1.62	OK	
606			TP RD M15	TP RD M14	1	1	C		30.00		230.88	1.907	1.963	3.39	26.11	2.25	0.680	0.000	0.680	30	200	203	DWC	-536	180	0.010	1.01	31.84	0.02	0.40	0.10	OK	0.40	OK	0.17	0.00	0.29	0.12	1.62	1.84	OK	
607			TP RD M14	LH-P RD M24	2	1	J		33.58		495.57	1.963	1.932	3.80	56.05	2.25	1.460	0.000	1.460	44	200	203	DWC	1083	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	-0.12	-0.18	2.08	2.11	OK	
608			LH-P RD M24.1	LH-P RD M24.2	0	1	H		31.30		31.30	1.884	1.847	3.54	3.54	2.25	0.092	0.000	0.092	11	200	203	DWC	846	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.78	0.61	1.10	1.24	OK	
609			LH-P RD M24.2	LH-P RD M24.3	1	1	C		30.00		61.30	1.847	1.903	3.39	6.93	2.25	0.181	0.000	0.181	16	200	203	DWC	-536	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.61	0.44	1.24	1.46	OK	
610			LH-P RD M24.3	LH-P RD M24.4	1	1	C		19.68		80.98	1.903	1.893	2.23	9.16	2.25	0.239	0.000	0.239	18	200	203	DWC	1998	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	0.44	0.33	1.46	1.56	OK	
611			LH-P RD M24.4	LH-P RD M24	2	1	C		16.98		97.96	1.893	1.932	1.92	11.08	2.25	0.289	0.000	0.289	20	200	203	DWC	-435	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	0.33	0.24	1.56	1.69	OK	
612			LH-P RD M24	LH-P RD M23	1	1	J		36.99		630.51	1.932	2.061	4.18	71.31	2.25	1.857	0.000	1.857	49	200	203	DWC	-287	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.07	0.00	-0.18	-0.18	-0.25	2.11	2.31	OK
613			LH-P RD M23	LH-P RD M22	1	1	C		17.94		648.45	2.061	2.111	2.03	73.34	2.25	1.910	0.000	1.910	50	200	203	DWC	-359	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.03	0.00	-0.25	-0.28	2.31	2.39	OK	
614			LH-P RD M22	LHP-KOT RD M21	1	1	C		30.00		678.45	2.111	2.160	3.39	76.73	2.25	1.998	0.000	1.998	51	200	203	DWC	-612	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	-0.28	-0.34	2.39	2.50	OK	
615			LHP-KOT RD M21	KOT RD M37.9	2	1	J		30.00		1684.50	2.160	2.312	3.39	190.52	2.25	4.961	0.000	4.961	80	200	203	DWC	-197	520	0.010	0.60	18.73	0.26	0.84	0.35	OK	0.50	OK	0.06	0.00	-0.34	-0.34	-0.40	2.50	2.71	OK
616			KOT RD M37.9	KOT RD M37.8	1	1	C		30.00		1714.50	2.312	2.077	3.39	193.91	2.25	5.050	0.000	5.050	81	200	203	DWC	128	520	0.010	0.60	18.73	0.27	0.85	0.36	OK	0.51	OK	0.06	0.00	-0.40	-0.46	2.71	2.54	OK	
617			KOT RD M37.8	KOT RD M37.7	1	1	C		30.00		1744.50	2.077	2.085	3.39	197.31	2.25	5.138	0.000	5.138	81	200	203	DWC	-3750	520	0.010	0.60	18.73	0.27	0.85	0.36	OK	0.51	OK	0.06	0.00	-0.46	-0.52	2.54	2.61	OK	
618			KOT RD M37.7	KOT RD M37.6	1	1	C		37.52		1782.02	2.085	2.092	4.24	201.55	2.25	5.249	0.000	5.249	82	200	203	DWC	-5360	520	0.010	0.60	18.73	0.28	0.86	0.37	OK	0.51	OK	0.07	0.00	-0.52	-0.59	2.61	2.68	OK	
619			TP RD M19.1	TP RD M19.2	0	1	H		25.00		25.00	2.244	2.204	2.83	2.83	2.25	0.074	0.000	0.074	10	200	203	DWC	625	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	1.14	1.00	1.10	1.20	OK	
620			TP RD M19.2	KOT RD M37.6	1	1	C		29.00		54.00	2.204	2.092	3.28	6.11	2.25	0.159	0.000	0.159	15	200	203	DWC	259	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	1.00	0.84	1.20	1.25	OK	
621			KOT RD M37.6	KOT RD M37.5	2	1	J		20.00		1856.02	2.092	2.071	2.26	209.92	2.25	5.467	0.000	5.467	84	200	203	DWC	952	520	0.010	0.60	18.73	0.29	0.87	0.38	OK	0.52	OK	0.04	0.00	-0.59	-0.59	-0.63	2.68	2.70	OK
622			KOT RD M37.5	KOT RD M37.4	1	1	C		21.71		1877.73	2.071	2.050	2.46	212.38	2.25	5.531	0.000	5.531	84	200	203	DWC	1034	520	0.010	0.60	18.73	0.30	0.88	0.38	OK	0.52	OK	0.04	0.00	-0.63	-0.67	2.70	2.72	OK	
623			KOT RD M37.4	KOT RD M37.3	1	1	C		27.44		1905.17	2.050	2.229	3.10	215.48	2.25	5.611	0.000	5.611	85	200	203	DWC	-153	520	0.010	0.60	18.73	0.30	0.88	0.38	OK	0.52	OK	0.05	0.00	-0.67	-0.72	2.72	2.95	OK	
624			KOT RD M37.3	KOT RD M37.2	1	1	C		35.00		1940.17	2.229	2.228	3.96	219.44	2.25	5.715	0.000	5.715	86	200	203	DWC	35000	520	0.010	0.60	18.73	0.31	0.88	0.39	OK	0.52	OK	0.07	0.00	-0.72	-0.79	2.95	3.02	OK	
625			KOT RD M37.2	KOT RD M37.1	1	1	C		20.00		1960.17	2.228	2.158	2.26	221.70	2.25	5.773	0.000	5.773	86	200	203	DWC	286	520	0.010	0.60	18.73	0.31	0.88	0.39	OK	0.52	OK	0.04	0.00	-0.79	-0.83	3.02	2.99	OK	
626			KOT RD M37.1	KOT RD M37	1	1	C		20.00		1980.17	2.158	2.266	2.26	223.96	2.25	5.832	0.000	5.832	87	200	203	DWC	-185	520	0.010	0.60	18.73	0.31	0.88	0.39	OK	0.52	OK	0.04	0.00	-0.83	-0.87	2.99	3.14	OK	
627			KOT RD M37	KOT RD M38	2	1	J		27.35		2177.52	2.264	2.743	3.09	246.28	2.25	6.414	0.000	6.414	91	200	203	DWC	-57	520	0.010	0.60	18.73	0.34	0.91	0.41	OK	0.54	OK	0.05	0.00	-0.87	-0.87	-0.92	3.13	3.66	OK
628			KOT RD M38	KOT RD M39	1	1	C		20.00		2197.52	2.743	2.960	2.26	248.54	2.25	6.473	0.000	6.473	91	200	203	DWC	-92	520	0.010	0.60	18.73	0.35	0.92	0.41	OK	0.55	OK	0.04	0.00	-0.92	-0.96	3.66	3.92	OK	
629			KOT RD M39	PLPDYRD M18	2	1	J		24.00		2901.41	2.650	2.960	2.71	328.16	2.25	8.546	0.000	8.546	105	200	203	DWC	-77	520	0.010	0.60	18.73	0.46	0.98	0.48	OK	0.58	OK	0.05	0.00	-0.96	-0.96	-1.01	3.61	3.97	OK
630			PLPDYRD M18	SFRW RD M16.8	2	1	J		27.96		5217.94	2.960	2.484	3.16	590.16	2.25	15.369	0.000	15.369	140	200	203	DWC	59	520	0.010	0.60	18.73	0.82	1.11	0.69	OK	0.66	OK	0.05	0.00	-1.01	-1.01	-1.06	3.97	3.54	OK
631			SFRW RD M16.8	SFRW RD M16.7	1	1	C																																			

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalltive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m		Depth of cutting in m		Check Depth of cutting		
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity (> 0.3m/s)			From	To	Starting Manhole	Ending manhole		
663			CHMNY L M9.1	CHMNY L M9.2	0	1	H		24.89		24.89	2.064	2.042	2.82	2.82	2.25	0.073	0.000	0.073	10	150	200	DWC	1132	180	0.010	0.84	14.79	0.00	0.30	0.07	OK	0.25	Check	0.14	0.00	0.96		0.82	1.10	1.22	OK
664			CHMNY L M9.2	CHMNY L M9.3	1	1	C		30.00		54.89	2.042	1.981	3.39	6.21	2.25	0.162	0.000	0.162	15	200	203	DWC	492	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.82		0.65	1.22	1.33	OK
665			CHMNY L M9.3	CHMNY L M9.4	1	1	C		32.64		87.54	1.981	2.014	3.69	9.90	2.25	0.258	0.000	0.258	19	200	203	DWC	-989	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	0.65		0.47	1.33	1.54	OK
666			CHMNY L M9.4	CHMNY L M9.5	1	1	C		31.02		118.56	2.014	2.678	3.51	13.41	2.25	0.349	0.000	0.349	22	200	203	DWC	-47	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.47		0.30	1.54	2.38	OK
667			CHMNY L M9.5	CHMNY L M12	1	1	C		25.88		144.44	2.678	1.820	2.93	16.34	2.25	0.425	0.000	0.425	24	200	203	DWC	30	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	0.30		0.16	2.38	1.66	OK
668			KK RD M1	KK RD M2	0	1	H		30.00		30.00	3.803	4.117	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	-96	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	2.70		2.53	1.10	1.59	OK
669			KK RD M2	KK RD M3	1	1	C		30.00		60.00	4.117	4.049	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	441	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.53		2.36	1.59	1.69	OK
670			KK RD M3	KK RD M4	1	1	C		30.02		90.02	4.049	3.854	3.40	10.18	2.25	0.265	0.000	0.265	19	200	203	DWC	154	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.36		2.19	1.69	1.66	OK
671			KK RD M4	KK RD M5	1	1	C		15.75		105.77	3.854	3.829	1.78	11.96	2.25	0.312	0.000	0.312	20	200	203	DWC	630	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	2.19		2.10	1.66	1.73	OK
672			KK RD M5	KK RD M6	1	1	C		30.00		135.77	3.829	3.747	3.39	15.36	2.25	0.400	0.000	0.400	23	200	203	DWC	366	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.10		1.93	1.73	1.82	OK
673			KK RD M6	KK RD M7	1	1	C		30.00		165.77	3.747	3.790	3.39	18.75	2.25	0.488	0.000	0.488	25	200	203	DWC	-698	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.09	0.00	1.93		1.84	1.82	1.95	OK
674			KK RD M7	KK RD M8	1	1	C		35.29		201.06	3.790	3.736	3.99	22.74	2.25	0.592	0.000	0.592	28	200	203	DWC	654	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.08	0.00	1.84		1.76	1.95	1.98	OK
675			KK RD M8.4	KK RD M8.3	0	1	H		30.79		30.79	2.210	3.410	3.48	3.48	2.25	0.091	0.000	0.091	11	200	203	DWC	-26	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.11		0.94	1.10	2.47	OK
676			KK RD M8.3	KK RD M8.2	1	1	C		30.00		60.79	3.410	3.436	3.39	6.88	2.25	0.179	0.000	0.179	16	200	203	DWC	-1154	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.94		0.77	2.47	2.67	OK
677			KK RD M8.2	KK RD M8.1	1	1	C		30.00		90.79	3.440	3.550	3.39	10.27	2.25	0.267	0.000	0.267	19	200	203	DWC	-273	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.77		0.60	2.67	2.95	OK
678			KK RD M8.1	KK RD M8	1	1	C		30.00		120.79	3.550	3.736	3.39	13.66	2.25	0.356	0.000	0.356	22	200	203	DWC	-161	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.60		0.43	2.95	3.31	OK
679			KK RD M8	KK RD M9	2	1	J		30.00		351.85	3.736	3.627	3.39	39.79	2.25	1.036	0.000	1.036	37	200	203	DWC	275	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	0.43	0.430	0.37	3.31	3.26	OK
680			KK RD M9	KK RD M10	1	1	C		21.91		373.76	3.627	3.671	2.48	42.27	2.25	1.101	0.000	1.101	38	200	203	DWC	-498	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.04	0.00	0.37		0.33	3.26	3.34	OK
681			KK RD M10.7	KK RD M10.6	0	1	H		12.50		12.50	3.710	3.521	1.41	1.41	2.25	0.037	0.000	0.037	7	200	203	DWC	66	66	0.010	1.67	52.59	0.00	0.30	0.07	OK	0.50	OK	0.19	0.00	2.61		2.42	1.10	1.10	OK
682			KK RD M10.6	KK RD M10.5	1	1	C		14.91		27.42	3.521	3.715	1.69	3.10	2.25	0.081	0.000	0.081	11	200	203	DWC	-77	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.08	0.00	2.42		2.34	1.10	1.38	OK
683			KK RD M10.5	KK RD M10.4	1	1	C		21.13		48.55	3.715	3.471	2.39	5.49	2.25	0.143	0.000	0.143	14	200	203	DWC	87	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	2.34		2.22	1.38	1.25	OK
684			KK RD M10.4	KK RD M10.3	1	1	C		20.16		68.70	3.471	3.595	2.28	7.77	2.25	0.202	0.000	0.202	17	200	203	DWC	-163	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.22		2.11	1.25	1.49	OK
685			KK RD M10.3	KK RD M10.2	1	1	C		9.05		77.75	3.595	3.605	1.02	8.79	2.25	0.229	0.000	0.229	18	200	203	DWC	-905	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.05	0.00	2.11		2.06	1.49	1.55	OK
686			KK RD M10.2	KK RD M10.1	1	1	C		19.50		97.25	3.605	3.646	2.20	11.00	2.25	0.286	0.000	0.286	20	200	203	DWC	-475	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.06		1.95	1.55	1.70	OK
687			KK RD M10.1	KK RD M10	1	1	C		30.00		127.25	3.650	3.671	3.39	14.39	2.25	0.375	0.000	0.375	22	200	203	DWC	-1429	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.95		1.78	1.70	1.89	OK
688			KK RD M10	KK RD M11	2	1	J		31.54		532.55	3.671	3.751	3.57	60.23	2.25	1.569	0.000	1.569	45	200	203	DWC	-394	520	0.010	0.60	18.73	0.08	0.61	0.20	OK	0.36	OK	0.06	0.00	0.33	0.330	0.27	3.34	3.48	OK
689			KK RD M11	KK RD M12	1	1	C		30.00		562.55	3.751	3.747	3.39	63.63	2.25	1.657	0.000	1.657	46	200	203	DWC	7500	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	0.27		0.21	3.48	3.54	OK
690			KK RD M12	KK RD M13	1	1	C		30.00		592.55	3.747	3.726	3.39	67.02	2.25	1.745	0.000	1.745	48	200	203	DWC	1429	520	0.010	0.60	18.73	0.09	0.63	0.21	OK	0.37	OK	0.06	0.00	0.21		0.15	3.54	3.58	OK
691			KK RD M13	KK RD M14	1	1	C		33.11		625.65	3.726	3.462	3.74	70.76	2.25	1.843	0.000	1.843	49	200	203	DWC	125	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	0.15		0.09	3.58	3.37	OK
692			KK RD M14	KK RD M15	1	1	C		29.95		655.60	3.462	3.628	3.39	74.15	2.25	1.931	0.000	1.931	50	200	203	DWC	-180	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	0.09		0.03	3.37	3.60	OK
693			KK RD M15	KK RD M16	1	1	C		31.37		686.97	3.628	3.793	3.55	77.70	2.25	2.023	0.000	2.023	51	200	203	DWC	-190	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	0.03		-0.03	3.60	3.82	OK
694			KK RD M16.6	KK RD M16.5	0	1	H		13.15		13.15	2.350	2.320	1.49	1.49	2.25	0.039	0.000	0.039	8	200	203	DWC	438	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.07	0.00	1.25		1.18	1.10	1.14	OK
695			KK RD M16.5	KK RD M16.4	1	1	C		20.77		33.92	2.320	2.430	2.35	3.84	2.25	0.100	0.000	0.100	12	200	203	DWC	-189	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	1.18		1.06	1.14	1.37	OK
696			KK RD M16.4	KK RD M16.3	1	1	C		1																																	

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalltife flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting	
			From	To								Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity y (> 0.3m/s)			From		To	Starting Manhole	Ending manhole	
728			KKR DR M15.1	KKR DR M15	1	1	C		30.63		74.38	3.350	3.635	3.46	8.41	2.25	0.219	0.000	0.219	17	200	203	DWC	-107	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.09		0.92	2.26	2.72	OK
729			KKR DR M15	KKR DR M16	2	1	J		23.82		808.46	3.635	3.630	2.69	91.44	2.25	2.381	0.000	2.381	56	200	203	DWC	4765	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.05	0.00	0.77	0.770	0.72	2.87	2.91	OK
730			KKR DR M16.3	KKR DR M16.2	0	1	H		20.40		20.40	2.430	3.112	2.31	2.31	2.25	0.060	0.000	0.060	9	200	203	DWC	-30	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.33		1.22	1.10	1.89	OK
731			KKR DR M16.2	KKR DR M16.1	1	1	C		30.00		50.40	3.112	3.350	3.39	5.70	2.25	0.148	0.000	0.148	14	200	203	DWC	-126	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.22		1.05	1.89	2.30	OK
732			KKR DR M16.1	KKR DR M16	1	1	C		30.00		80.40	3.350	3.638	3.39	9.09	2.25	0.237	0.000	0.237	18	200	203	DWC	-104	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.05		0.88	2.30	2.76	OK
733			KKR DR M16	KKR DR M17	2	1	J		31.57		920.42	3.640	3.725	3.57	104.10	2.25	2.711	0.000	2.711	59	200	203	DWC	-371	520	0.010	0.60	18.73	0.14	0.71	0.26	OK	0.42	OK	0.06	0.00	0.72	0.720	0.66	2.92	3.07	OK
734			KKR DR M17	KKR DR M18	1	1	C		8.96		929.39	3.725	3.405	1.01	105.12	2.25	2.737	0.000	2.737	60	200	203	DWC	28	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.02	0.00	0.66		0.64	3.07	2.77	OK
735			KKR DR M18	STFRKK RD M17	1	1	C		19.79		949.18	3.405	3.258	2.24	107.35	2.25	2.796	0.000	2.796	60	200	203	DWC	135	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.04	0.00	0.64		0.60	2.77	2.66	OK
736			STFRKK RD M17	STFRCH RD M1	2	1	J		30.00		1823.73	3.258	3.242	3.39	206.27	2.25	5.372	0.000	5.372	83	200	203	DWC	1875	520	0.010	0.60	18.73	0.29	0.87	0.38	OK	0.52	OK	0.06	0.00	-0.08	-0.080	-0.14	3.34	3.38	OK
737			STFRCH RD M1	STFRCH RD M2	1	1	C		30.00		1853.73	3.242	3.285	3.39	209.66	2.25	5.460	0.000	5.460	84	200	203	DWC	-698	520	0.010	0.60	18.73	0.29	0.87	0.38	OK	0.52	OK	0.06	0.00	-0.14		-0.20	3.38	3.49	OK
738			STFRCH RD M2	KTKRSTFRCH RD M10	1	1	C		17.48		1871.21	3.285	3.076	1.98	211.64	2.25	5.511	0.000	5.511	84	200	203	DWC	84	520	0.010	0.60	18.73	0.29	0.87	0.38	OK	0.52	OK	0.03	0.00	-0.20		-0.23	3.49	3.31	OK
739			STFRCH RD M7A	STFRCH RD M7	0	1	H		22.58		22.58	3.760	3.529	2.55	2.55	2.25	0.066	0.000	0.066	10	200	203	DWC	98	95	0.010	1.39	43.83	0.00	0.30	0.07	OK	0.42	OK	0.24	0.00	2.66		2.42	1.10	1.11	OK
740			STFRCH RD M7	STFRCH RD M6	1	1	C		17.61		40.19	3.529	3.408	1.99	4.55	2.25	0.118	0.000	0.118	13	200	203	DWC	146	146	0.010	1.12	35.36	0.00	0.30	0.07	OK	0.34	OK	0.12	0.00	2.42		2.30	1.11	1.11	OK
741			STFRCH RD M6	STFRCH RD M5	1	1	C		30.00		70.19	3.408	3.256	3.39	7.94	2.25	0.207	0.000	0.207	17	200	203	DWC	197	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.30		2.13	1.11	1.13	OK
742			STFRCH RD M5	STFRCH RD M4	1	1	C		30.00		100.19	3.256	3.088	3.39	11.33	2.25	0.295	0.000	0.295	20	200	203	DWC	179	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	2.13		1.96	1.13	1.13	OK
743			STFRCH RD M4.8	STFRCH RD M4.7	0	1	H		15.63		15.63	3.543	3.548	1.77	1.77	2.25	0.046	0.000	0.046	8	200	203	DWC	-3126	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.09	0.00	2.44		2.35	1.10	1.20	OK
744			STFRCH RD M4.7	STFRCH RD M4.6	1	1	C		26.28		41.91	3.548	3.282	2.97	4.74	2.25	0.123	0.000	0.123	13	200	203	DWC	99	155	0.010	1.09	34.32	0.00	0.30	0.07	OK	0.33	OK	0.17	0.00	2.35		2.18	1.20	1.10	OK
745			STFRCH RD M4.6	STFRCH RD M4.5	1	1	C		10.04		51.95	3.282	3.443	1.14	5.88	2.25	0.153	0.000	0.153	14	200	203	DWC	-62	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.06	0.00	2.18		2.12	1.10	1.32	OK
746			STFRCH RD M4.5	STFRCH RD M4.4	1	1	C		12.27		64.22	3.443	3.386	1.39	7.26	2.25	0.189	0.000	0.189	16	200	203	DWC	215	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.07	0.00	2.12		2.05	1.32	1.34	OK
747			STFRCH RD M4.4	STFRCH RD M4.3	1	1	C		19.80		84.02	3.386	3.425	2.24	9.50	2.25	0.247	0.000	0.247	18	200	203	DWC	-508	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	2.05		1.94	1.34	1.49	OK
748			STFRCH RD M4.3	STFRCH RD M4.2	1	1	C		17.51		101.53	3.425	3.443	1.98	11.48	2.25	0.299	0.000	0.299	20	200	203	DWC	-973	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.10	0.00	1.94		1.84	1.49	1.60	OK
749			STFRCH RD M4.2	STFRCH RD M4.1	1	1	C		25.98		127.50	3.443	3.441	2.94	14.42	2.25	0.376	0.000	0.376	22	200	203	DWC	12989	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	1.84		1.70	1.60	1.74	OK
750			STFRCH RD M4.1	STFRCH RD M4A	1	1	C		20.57		148.07	3.441	3.260	2.33	16.75	2.25	0.436	0.000	0.436	24	200	203	DWC	114	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0.00	1.70		1.59	1.74	1.67	OK
751			STFRCH RD M4A	STFRCH RD M4	1	1	C		20.00		168.07	3.260	3.088	2.26	19.01	2.25	0.495	0.000	0.495	26	200	203	DWC	116	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.06	0.00	1.59		1.53	1.67	1.56	OK
752			STFRCH RD M4	STFRCH RD M3	2	1	J		23.00		291.26	3.088	3.079	2.60	32.94	2.25	0.858	0.000	0.858	34	200	203	DWC	2556	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	1.53	1.530	1.49	1.56	1.59	OK
753			STFRCH RD M3	KTKRSTFRCH RD M10	1	1	C		30.00		321.26	3.079	3.079	3.39	36.34	2.25	0.946	0.000	0.946	35	200	203	DWC	0	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	1.49		1.43	1.59	1.65	OK
754			KTKRSTFRCH RD M10	KTKR RD M9	2	1	J		30.00		2222.47	3.076	2.935	3.39	251.37	2.25	6.546	0.000	6.546	92	200	203	DWC	213	520	0.010	0.60	18.73	0.35	0.92	0.41	OK	0.55	OK	0.06	0.00	-0.23	-0.23	-0.29	3.31	3.23	OK
755			KTKR RD M9	KTKR RD M8	1	1	C		30.00		2252.47	2.935	2.884	3.39	254.76	2.25	6.634	0.000	6.634	92	200	203	DWC	588	520	0.010	0.60	18.73	0.35	0.92	0.41	OK	0.55	OK	0.06	0.00	-0.29		-0.35	3.23	3.23	OK
756			KTKR RD M8	KTKR RD M7	1	1	C		30.00		2282.47	2.884	2.804	3.39	258.15	2.25	6.723	0.000	6.723	93	200	203	DWC	375	520	0.010	0.60	18.73	0.36	0.92	0.42	OK	0.55	OK	0.06	0.00	-0.35		-0.41	3.23	3.21	OK
757			KTKRRDM7.8.1	KTKRRDM7.8	0	1	H		13.00		13.00	2.450	2.360	1.47	1.47	2.25	0.038	0.000	0.038	7	200	203	DWC	144	144	0.010	1.13	35.60	0.00	0.30	0.07	OK	0.34	OK	0.09	0.00	1.35		1.26	1.10	1.10	OK
758			KTKRRDM7.8.2	KTKRRDM7.8	0	1	H		26.00		26.00	2.544	2.360	2.94	2.94	2.25	0.077	0.000	0.077	10	200	203	DWC	141	141	0.010	1.14	35.98	0.00	0.30	0.07	OK	0.34	OK	0.18	0.00	1.44		1.26	1.10	1.10	OK
759			KTKRRDM7.8	KTKR RD M7.7	2	1	J		7.00		46.00	2.360	2.340	0.79	5.20	2.25	0.135	0.000	0.135	14	200	203	DWC	350	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.04	0.00	1.26	1.26	1.22	1.10	1.12	OK
760			KTKR RD M7.7	KTKR RD M7.6A	1	1	C		20.00		66.00	2.340	2.224	2.26	7.46	2.25	0.194	0.000	0.194	16	200	203	DWC	172	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.11	0						

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting	
												Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s			Check Velocity y (> 0.3m/s)	From	To	Starting Manhole	Ending manhole		
			From	To																																						
794			KOT-RBIQ RD M7	KOT RD M8	1	1	C		30.00		210.00	1.864	2.177	3.39	23.75	2.25	0.619	0.000	0.619	29	200	203	DWC	-96	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.07	0.00	-0.33		-0.40	2.19	2.58	OK
795			KOT RD M8	KOT RD M9	1	1	C		20.00		230.00	2.177	2.193	2.26	26.01	2.25	0.677	0.000	0.677	30	200	203	DWC	-1250	420	0.010	0.66	20.85	0.03	0.46	0.13	OK	0.30	OK	0.05	0.00	-0.40		-0.45	2.58	2.64	OK
796			KOT RD M9	SEB-KOT RD M3	1	1	C		28.00		258.00	2.193	2.209	3.17	29.18	2.25	0.760	0.000	0.760	32	200	203	DWC	-1750	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.05	0.00	-0.45		-0.50	2.64	2.71	OK
797			SBN RD M8	SBN RD M7	0	1	H		30.00		30.00	3.280	2.890	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	77	77	0.010	1.55	48.69	0.00	0.30	0.07	OK	0.46	OK	0.39	0.00	2.18		1.79	1.10	1.10	OK
798			SBN RD M7	SBN RD M6	1	1	C		30.00		60.00	2.893	2.436	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	66	65	0.010	1.68	52.99	0.00	0.30	0.07	OK	0.51	OK	0.46	0.00	1.79		1.33	1.10	1.11	OK
799			SBN RD M6	SBN RD M5	1	1	C		30.00		90.00	2.436	2.664	3.39	10.18	2.25	0.265	0.000	0.265	19	200	203	DWC	-132	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	1.33		1.16	1.11	1.50	OK
800			SBN RD M5.2	SBN RD M5.1	0	1	H		22.00		22.00	2.770	2.725	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	489	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	1.67		1.55	1.10	1.18	OK
801			SBN RD M5.1	SBN RD M5	1	1	C		30.00		52.00	2.725	2.664	3.39	5.88	2.25	0.153	0.000	0.153	14	200	203	DWC	492	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.55		1.38	1.18	1.28	OK
802			SBN RD M5	SBN RD M4	2	1	J		26.00		168.00	2.480	2.664	2.94	19.00	2.25	0.495	0.000	0.495	26	200	203	DWC	-141	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.08	0.00	1.16	1.16	1.08	1.32	1.58	OK
803			SBN RD M4.5	SBN RD M4.4	0	1	H		22.00		22.00	2.490	2.461	2.49	2.49	2.25	0.065	0.000	0.065	10	200	203	DWC	759	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.12	0.00	1.39		1.27	1.10	1.19	OK
804			SBN RD M4.4	SBN RD M4.3	1	1	C		30.00		52.00	2.461	2.630	3.39	5.88	2.25	0.153	0.000	0.153	14	200	203	DWC	-178	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.27		1.10	1.19	1.53	OK
805			SBN RD M4.3	SBN RD M4.2	1	1	C		37.00		89.00	2.630	2.431	4.18	10.07	2.25	0.262	0.000	0.262	19	200	203	DWC	186	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.21	0.00	1.10		0.89	1.53	1.54	OK
806			SBN RD M4.2	SBN RD M4.1	1	1	C		30.00		119.00	2.431	2.457	3.39	13.46	2.25	0.350	0.000	0.350	22	200	203	DWC	-1154	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.89		0.72	1.54	1.74	OK
807			SBN RD M4.1	SBN RD M4	1	1	C		30.00		149.00	2.457	2.486	3.39	16.85	2.25	0.439	0.000	0.439	24	200	203	DWC	-1034	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.72		0.55	1.74	1.94	OK
808			SBN RD M4	SBN RD M3	2	1	J		14.00		331.00	2.486	2.364	1.58	37.44	2.25	0.975	0.000	0.975	36	200	203	DWC	115	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.03	0.00	0.55	0.55	0.52	1.94	1.84	OK
809			SBN RD M3	SBN RD M2	1	1	C		30.00		361.00	2.364	2.035	3.39	40.83	2.25	1.063	0.000	1.063	37	200	203	DWC	91	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	0.52		0.46	1.84	1.58	OK
810			SBN RD M2	SBN RD M1	1	1	C		30.00		391.00	2.035	1.750	3.39	44.22	2.25	1.152	0.000	1.152	39	200	203	DWC	105	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	0.46		0.40	1.58	1.35	OK
811			SBN RD M1	SEB-KOT RD M3	1	1	C		30.00		421.00	1.750	2.209	3.39	47.62	2.25	1.240	0.000	1.240	40	200	203	DWC	-65	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	0.40		0.34	1.35	1.87	OK
812			VLN RD M5	VLN RD M4	0	1	H		25.00		25.00	2.514	2.345	2.83	2.83	2.25	0.074	0.000	0.074	10	200	203	DWC	148	148	0.010	1.12	35.12	0.00	0.30	0.07	OK	0.33	OK	0.17	0.00	1.41		1.24	1.10	1.11	OK
813			VLN RD M4	VLN RD M3	1	1	C		25.00		50.00	2.345	2.394	2.83	5.66	2.25	0.147	0.000	0.147	14	200	203	DWC	-510	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	1.24		1.10	1.11	1.29	OK
814			VLN RD M3	VLN RD M2	1	1	C		30.00		80.00	2.394	2.364	3.39	9.05	2.25	0.236	0.000	0.236	18	200	203	DWC	1000	180																	

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
												Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (v1) m/s	Check Velocity y (> 0.3m/s)			From		To	Starting Manhole	Ending manhole	
859			SAS RD M4	SAS RD M5	1	1	C		11.00		675.00	3.490	3.497	1.24	76.34	2.25	1.988	0.000	1.988	51	200	203	DWC	-1571	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.02	0.00	1.89		1.87	1.60	1.63	OK
860			SAS RD M5	SAS RD M6	1	1	C		19.00		694.00	3.497	3.461	2.15	78.49	2.25	2.044	0.000	2.044	52	200	203	DWC	528	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.04	0.00	1.87		1.83	1.63	1.63	OK
861			SAS RD M6	SAS-KLN RD M7	1	1	C		30.00		724.00	3.461	3.361	3.39	81.89	2.25	2.132	0.000	2.132	53	200	203	DWC	300	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	1.83		1.77	1.63	1.59	OK
862			KLN RD M1	KLN RD M2	0	1	H		20.00		20.00	3.084	3.146	2.26	2.26	2.25	0.059	0.000	0.059	9	200	203	DWC	-323	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.11	0.00	1.98		1.87	1.10	1.28	OK
863			KLN RD M2	KLN RD M3	1	1	C		30.00		50.00	3.146	3.208	3.39	5.66	2.25	0.147	0.000	0.147	14	200	203	DWC	-484	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	1.87		1.70	1.28	1.51	OK
864			KLN RD M3	KLN RD M4	1	1	C		220.00		270.00	3.208	3.167	24.88	30.54	2.25	0.795	0.000	0.795	32	200	203	DWC	5366	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.42	0.00	1.70		1.28	1.51	1.89	OK
865			KLN RD M4	KLN RD M5	1	1	C		26.00		296.00	3.167	3.304	2.94	33.48	2.25	0.872	0.000	0.872	34	200	203	DWC	-190	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.05	0.00	1.28		1.23	1.89	2.07	OK
866			KLN RD M5	KLN RD M6	1	1	C		30.00		326.00	3.304	3.246	3.39	36.87	2.25	0.960	0.000	0.960	35	200	203	DWC	517	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.06	0.00	1.23		1.17	2.07	2.08	OK
867			KLN RD M6	KLN RD M7	1	1	C		30.00		356.00	3.246	2.179	3.39	40.26	2.25	1.049	0.000	1.049	37	200	203	DWC	28	310	0.010	0.77	24.26	0.04	0.51	0.15	OK	0.39	OK	0.10	0.00	1.17		1.07	2.08	1.11	OK
868			KLN RD M7	KLN RD M8	1	1	C		30.00		386.00	2.179	2.954	3.39	43.66	2.25	1.137	0.000	1.137	39	200	203	DWC	-39	520	0.010	0.60	18.73	0.06	0.55	0.17	OK	0.33	OK	0.06	0.00	1.07		1.01	1.11	1.94	OK
869			KLN RD M8	KLN RD M9	1	1	C		30.00		416.00	2.954	3.158	3.39	47.05	2.25	1.225	0.000	1.225	40	200	203	DWC	-147	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	1.01		0.95	1.94	2.21	OK
870			KLN RD M9	SAS-KLN RD M7	1	1	C		30.00		446.00	3.158	3.361	3.39	50.44	2.25	1.314	0.000	1.314	41	200	203	DWC	-148	520	0.010	0.60	18.73	0.07	0.59	0.19	OK	0.35	OK	0.06	0.00	0.95		0.89	2.21	2.47	OK
871			SAS-KLN RD M7	SAS RD M8	2	1	J		30.00		1200.00	3.360	3.063	3.39	135.72	2.25	3.534	0.000	3.534	68	200	203	DWC	101	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.06	0.00	0.89	0.89	0.83	2.47	2.23	OK
872			SAS RD M8	SAS RD M9	1	1	C		30.00		1230.00	3.063	2.765	3.39	139.12	2.25	3.623	0.000	3.623	68	200	203	DWC	101	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.06	0.00	0.83		0.77	2.23	2.00	OK
873			SAS RD M9	SAS RD M10	1	1	C		35.00		1265.00	2.765	2.173	3.96	143.07	2.25	3.726	0.000	3.726	69	200	203	DWC	59	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.07	0.00	0.77		0.70	2.00	1.47	OK
874			SAS RD M10	SAS-JA RD M11	1	1	C		15.00		1280.00	2.173	1.737	1.70	144.77	2.25	3.770	0.000	3.770	70	200	203	DWC	34	230	0.010	0.89	28.17	0.13	0.70	0.25	OK	0.63	OK	0.07	0.00	0.70		0.63	1.47	1.11	OK
875			1CR RD M2	1CR RD M1	0	1	H		30.00		30.00	1.644	1.638	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	5000	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.54		0.37	1.10	1.27	OK
876			1CR RD M1	JA-1CR RD M7	1	1	C		30.00		60.00	1.638	1.891	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	-119	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.37		0.20	1.27	1.69	OK
877			JA-1CR RD M7	JA-2CR RD M8	1	1	C		17.00		77.00	1.891	1.874	1.92	8.71	2.25	0.227	0.000	0.227	17	200	203	DWC	1000	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.09	0.00	0.20		0.11	1.69	1.76	OK
878			2CR RD M2	2CR RD M1	0	1	H		30.00		30.00	1.612	1.588	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	1250	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.51		0.34	1.10	1.25	OK
879			2CR RD M1	JA-2CR RD M8	1	1	C		30.00		60.00	1.588	1.874</																													

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting	
												Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Manning s n	Velocit y (V)m/s	Discharge (Q) LPS	Discharg e Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0 .75)	Actual Velocity (v1) m/s			Check Velocity y (> 0.3m/s)	From	To	Starting Manhole	Ending manhole		
			From	To																																						
924			SST RD M3.1	SST RD M3	1	1	C		35.00		70.84	2.052	1.993	3.96	8.01	2.25	0.209	0.000	0.209	17	200	203	DWC	593	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	0.81		0.62	1.24	1.37	OK
925			SST RD M3	SST RD M2	2	1	J		15.33		742.09	1.993	1.995	1.73	83.93	2.25	2.186	0.000	2.186	53	200	203	DWC	-7663	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.03	0.00	0.06	0.06	0.03	1.93	1.97	OK
926			SST RD M2	SST-KOT RD M1	1	1	C		27.00		769.09	1.995	2.088	3.05	86.99	2.25	2.265	0.000	2.265	54	200	203	DWC	-290	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.05	0.00	0.03		-0.02	1.97	2.11	OK
927			SST-KOT RD M1	KOT RD M15.5	1	1	C		32.95		802.04	2.088	1.915	3.73	90.71	2.25	2.362	0.000	2.362	55	200	203	DWC	190	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.06	0.00	-0.02		-0.08	2.11	2.00	OK
928			KOT RD M15.5	KOT RD M15.4	1	1	C		17.41		819.45	1.915	1.909	1.97	92.68	2.25	2.414	0.000	2.414	56	200	203	DWC	2901	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.03	0.00	-0.08		-0.11	2.00	2.02	OK
929			KOT RD M15.4	KOT RD M15.3	1	1	C		29.98		849.42	1.909	1.755	3.39	96.07	2.25	2.502	0.000	2.502	57	200	203	DWC	195	520	0.010	0.60	18.73	0.13	0.70	0.25	OK	0.42	OK	0.06	0.00	-0.11		-0.17	2.02	1.93	OK
930			SST RD M2.1	SST RD M2.2	0	1	H		24.96		24.96	1.943	1.993	2.82	2.82	2.25	0.074	0.000	0.074	10	200	203	DWC	-499	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.14	0.00	0.84		0.70	1.10	1.29	OK
931			SST RD M2.2	SST RD M2.3	1	1	C		28.11		53.07	1.993	1.824	3.18	6.00	2.25	0.156	0.000	0.156	15	200	203	DWC	166	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.16	0.00	0.70		0.54	1.29	1.28	OK
932			SST RD M2.4	SST RD M2.3	0	1	H		22.37		22.37	1.954	1.824	2.53	2.53	2.25	0.066	0.000	0.066	10	200	203	DWC	172	172	0.010	1.03	32.58	0.00	0.30	0.07	OK	0.31	OK	0.13	0.00	0.85		0.72	1.10	1.10	OK
933			SST RD M2.3	KOT RD M15.3	2	1	J		33.93		109.38	1.824	1.755	3.84	12.37	2.25	0.322	0.000	0.322	21	200	203	DWC	492	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.19	0.00	0.54	0.54	0.35	1.28	1.41	OK
934			KOT RD M15.3	KOT RD M15.2	2	1	J		13.15		971.95	1.755	1.841	1.49	109.93	2.25	2.863	0.000	2.863	61	200	203	DWC	-153	520	0.010	0.60	18.73	0.15	0.73	0.27	OK	0.43	OK	0.03	0.00	-0.17	-0.17	-0.20	1.93	2.04	OK
935			KOT RD M15.2	KOT RD M15.1	1	1	C		25.00		996.95	1.840	1.797	2.83	112.76	2.25	2.936	0.000	2.936	62	200	203	DWC	581	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.05	0.00	-0.20		-0.25	2.04	2.05	OK
936			KOT RD M15.1	KOT RD M15	1	1	C		25.00		1021.95	1.797	1.832	2.83	115.58	2.25	3.010	0.000	3.010	62	200	203	DWC	-714	520	0.010	0.60	18.73	0.16	0.74	0.28	OK	0.44	OK	0.05	0.00	-0.25		-0.30	2.05	2.13	OK
937			KOT RD M15	KOT RD M16	2	1	J		33.00		7337.42	1.832	1.895	3.73	829.88	2.25	21.611	0.000	21.611	166	250	253	DWC	-524	700	0.010	0.60	29.28	0.74	1.09	0.64	OK	0.65	OK	0.05	0.00	-0.94	-0.94	-0.99	2.77	2.89	OK
938			KOT RD M16	KOT RD M17	1	1	C		33.57		7370.99	1.895	1.957	3.80	833.67	2.25	21.710	0.000	21.710	167	250	253	DWC	-542	700	0.010	0.60	29.28	0.74	1.09	0.64	OK	0.65	OK	0.05	0.00	-0.99		-1.04	2.89	3.00	OK
939			KOT RD M17.1	KOT RD M17	0	1	H		30.00		30.00	1.710	1.960	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	-120	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.61		0.44	1.10	1.52	OK
940			KOT RD M17	KOT RD M18	2	1	J		23.10		7424.09	1.957	1.935	2.61	839.68	2.25	21.867	0.000	21.867	167	250	253	DWC	1050	700	0.010	0.60	29.28	0.75	1.10	0.65	OK	0.65	OK	0.03	0.00	-1.04	-1.04	-1.07	3.00	3.01	OK
941			KOT RD M18	KOT RD M19	1	1	C		14.63		7438.72	1.935	1.982	1.65	841.33	2.25	21.910	0.000	21.910	168	250	253	DWC	-311	700	0.010	0.60	29.28	0.75	1.10	0.65	OK	0.65	OK	0.02	0.00	-1.07		-1.09	3.01	3.07	OK
942			KOT RD M19.1	KOT RD M19.2	0	1	H		30.00		30.00	1.914	1.887	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	1111	180	0.010	1.01	31.84	0.00	0.30	0.07	OK	0.30	OK	0.17	0.00	0.81		0.64	1.10	1.25	OK
943			KOT RD M19.2	KOT RD M19	1	1	C		30.00		60.00	1.887	1.982	3.39	6.79	2.25	0.177	0.000	0.177	16	200	203	DWC	-316	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.17	0.00	0.64		0.47	1.25	1.51	OK
944			KOT RD M19	KOT RD																																						

Sl. No.	Road	Element	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumalitive flow in cum/day	FLOWS LPS				Require d dia.		Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow					Fall m	Manhole Drop m	Invert Level in m			Depth of cutting in m		Check Depth of cutting
												Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GW+UAC	Total Flow			ID	OD				Manning s n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.75)	Actual Velocity (vt) m/s			Check Velocity y (> 0.3m/s)	From		To	Starting Manhole	
989			OSTARDM6	OSTARDM7	1	1	C		33.00		87.00	2.636	2.324	3.73	9.84	2.25	0.256	0.000	0.256	19	200	203	DWC	106	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	0.86		0.68	1.78	1.64	OK
990			OSTARDM7	OSTA-LHP RD M8	1	1	C		31.80	118.80	2.324	2.204	3.60	13.44	2.25	0.350	0.000	0.350	22	200	203	DWC	265	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.18	0.00	0.68		0.50	1.64	1.70	OK	
991			OSTA-LHP RD M8	LH-P RD M9	2	1	J		30.00	641.20	2.204	2.165	3.39	72.52	2.25	1.889	0.000	1.889	50	200	203	DWC	769	520	0.010	0.60	18.73	0.10	0.65	0.22	OK	0.39	OK	0.06	0.00	0.50	0.50	0.44	1.70	1.73	OK	
992			LH-P RD M9	LH-P RD M10	1	1	C		30.00	671.20	2.165	2.122	3.39	75.91	2.25	1.977	0.000	1.977	51	200	203	DWC	698	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	0.44		0.38	1.73	1.74	OK	
993			LH-P RD M10	LH-P RD M11	1	1	C		30.00	701.20	2.122	2.040	3.39	79.31	2.25	2.065	0.000	2.065	52	200	203	DWC	366	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.06	0.00	0.38		0.32	1.74	1.72	OK	
994			LH-P RD M11	LH-P RD M12	1	1	C		27.00	728.20	2.040	1.977	3.05	82.36	2.25	2.145	0.000	2.145	53	200	203	DWC	429	520	0.010	0.60	18.73	0.11	0.67	0.23	OK	0.40	OK	0.05	0.00	0.32		0.27	1.72	1.71	OK	
995			LH-P RD M12	KOT-LHPRDM28.9	1	1	C		23.00	751.20	1.977	2.064	2.60	84.96	2.25	2.213	0.000	2.213	54	200	203	DWC	-264	520	0.010	0.60	18.73	0.12	0.69	0.24	OK	0.41	OK	0.04	0.00	0.27		0.23	1.71	1.83	OK	
996			KOT-LHPRDM28.9	KOT RD M28.8	2	1	J		22.14	1151.75	2.064	2.146	2.50	130.26	2.25	3.392	0.000	3.392	66	200	203	DWC	-270	520	0.010	0.60	18.73	0.18	0.76	0.30	OK	0.45	OK	0.04	0.00	0.23	0.23	0.19	1.83	1.96	OK	
997			KOT RD M28.8	KOT RD M28.7	1	1	C		30.00	1181.75	2.146	2.227	3.39	133.66	2.25	3.481	0.000	3.481	67	200	203	DWC	-370	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.06	0.00	0.19		0.13	1.96	2.10	OK	
998			KOT RD M28.7	KOT RD M28.6	1	1	C		30.00	1211.75	2.227	2.218	3.39	137.05	2.25	3.569	0.000	3.569	68	200	203	DWC	3333	520	0.010	0.60	18.73	0.19	0.77	0.30	OK	0.46	OK	0.06	0.00	0.13		0.07	2.10	2.15	OK	
999			KOT RD M28.6	KOT RD M28.5	1	1	C		30.00	1241.75	2.218	2.134	3.39	140.44	2.25	3.657	0.000	3.657	69	200	203	DWC	357	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.06	0.00	0.07		0.01	2.15	2.12	OK	
1000			KOT RD M28.5	KOT RD M28.4	1	1	C		34.33	1276.08	2.134	2.163	3.88	144.33	2.25	3.759	0.000	3.759	70	200	203	DWC	-1184	520	0.010	0.60	18.73	0.20	0.78	0.31	OK	0.46	OK	0.07	0.00	0.01		-0.06	2.12	2.22	OK	
1001			KOT RD M28.4	KOT RD M28.3	1	1	C		35.00	1311.08	2.163	2.130	3.96	148.29	2.25	3.862	0.000	3.862	71	200	203	DWC	1061	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.07	0.00	-0.06		-0.13	2.22	2.26	OK	
1002			KOT RD M28.3	KOT RD M28.2	1	1	C		20.00	1331.08	2.130	2.091	2.26	150.55	2.25	3.921	0.000	3.921	71	200	203	DWC	513	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.04	0.00	-0.13		-0.17	2.26	2.26	OK	
1003			KOT RD M28.2	KOT RD M28.1	1	1	C		20.00	1351.08	2.091	2.052	2.26	152.81	2.25	3.979	0.000	3.979	72	200	203	DWC	513	520	0.010	0.60	18.73	0.21	0.79	0.32	OK	0.47	OK	0.04	0.00	-0.17		-0.21	2.26	2.26	OK	
1004			KOT RD M30	KOT RD M29	0	1	H		30.00	30.00	3.254	2.687	3.39	3.39	2.25	0.088	0.000	0.088	11	200	203	DWC	53	53	0.010	1.86	58.68	0.00	0.30	0.07	OK	0.56	OK	0.57	0.00	2.15		1.58	1.10	1.11	OK	
1005			KOT RD M29	KOT RD M28.1	1	1	C		21.45	51.45	2.687	2.052	2.43	5.82	2.25	0.152	0.000	0.152	14	200	203	DWC	34	34	0.010	2.33	73.27	0.00	0.30	0.07	OK	0.70	OK	0.63	0.00	1.58		0.95	1.11	1.10	OK	
1006			KOT RD M28.1	KOT RD M27	2	1	J		39.11	1441.64	2.052	2.190	4.42	163.05	2.25	4.246	0.000	4.246	74	200	203	DWC	-283	520	0.010	0.60	18.73	0.23	0.81	0.33	OK	0.48	OK	0.08	0.00	-0.21	-0.21	-0.29	2.26	2.48	OK	
1007			KOT RD M27	KOT RD M26	1	1	C		25.00	1466.64	2.190	2.055	2.83	165.88	2.25	4.320	0.000	4.320	75	200	203	DWC	185	520	0.010	0.60	18.73	0.23	0.81	0.33	OK	0.48	OK	0.05	0.00	-0.29		-0.34	2.48	2.40	OK	
1008			KOT RD M26	KOT RD M25	1	1	C		30.00	1496.64	2.055	2.139	3.39	169.27	2.25	4.408	0.000	4.408	75	200	203	DWC	-357	520	0.010	0.60	18.73	0.24	0.83	0.34	OK	0.49	OK	0.06	0.00	-0.34		-0.40	2.40	2.54	OK	
1009			KOT RD M25	KOT RD M24	1	1	C		23.05	1519.69	2.139	2.139	2.61	171.88	2.25	4.476	0.000	4.476	76	200	203	DWC	0	520	0.010	0.60	18.73	0.24	0.83	0.34	OK	0.49	OK	0.04	0.00	-0.40		-0.44	2.54	2.58	OK	
1010			KOT RD M24	KOT RD M23	1	1	C		26.33	1546.01	2.139	2.111	2.98	174.86	2.25	4.554	0.000	4.554	77	200	203	DWC	940	520	0.010	0.60	18.73	0.24	0.83	0.34	OK	0.49	OK	0.05	0.00	-0.44		-0.49	2.58	2.60	OK	
1011			KOT RD M23	KOT-JU RD M23A	1	1	C		30.00	1576.01	2.111	2.311	3.39	178.25	2.25	4.642	0.000	4.642	77	200	203	DWC	-150	520	0.010	0.60	18.73	0.25	0.84	0.35	OK	0.50	OK	0.06	0.00	-0.49		-0.55	2.60	2.86	OK	
1012			KOT-JU RD M23A	CHMNY L M12	2	1	J		20.00	9232.38	2.311	1.820	2.26	1044.20	2.25	27.193	0.000	27.193	187	300	304	DWC	41	870	0.010	0.60	42.70	0.64	1.06	0.59	OK	0.64	OK	0.02	0.00	-2.13	-2.13	-2.15	4.44	3.97	OK	
1013			CHMNY L M12	WW	4	0	J	L	10.00	26587.71	1.590	1.590	1.13	3007.13	2.25	78.311	0.000	78.311	316	427	500	HDPE	0	1000	0.010	0.71	102.11	0.77	1.10	0.66	OK	0.78	OK	0.01	0.00	-2.15	-2.150	-2.16	3.74	3.75	OK	

SEWER NETWORK DESIGN - ELANKULAM-BLOCK13																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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1.10.Elamkulam-BLOCK 13

Sl. No.	Man Holes				Manhole Type	MANHOLE TYPE	Length in m	CUMULATIVE LENGTH IN M	Cumulative length in m	Ground Levels		DWF in cum/day	Cumulative flow in cum/day	FLOWS LPS				Required dia.	Proposed Size of Sewer in mm		MOC	Ground Slope 1 in L	Slope Provided in Pipe 1 in L	As per Manning Table			At Ultimate peak flow						Fall m	Manhole Drop m	Invert Level in m		Depth of cutting in m		Check Depth of cutting
										Starting Manhole	Ending Manhole			Peak Factor	Cum Peak Factor	GWI+UAC	Total Flow		ID	OD				Mannings n	Velocity (V)m/s	Discharge (Q) LPS	Discharge Ratio (q1/Q)	Velocity Ratio (v1/V)	Depth Ratio (d/D)	check (d/D<0.7)	Actual Velocity (v1) m/s	Check Velocity (>0.6m/s)			From	To	Starting Manhole	Ending manhole	
214	DP RD M4.1	DP RD M4	1	1	C		25	93.00	2.281	2.164	4.02	14.97	2.25	0.390	0.000	0.390	23	200	203	DWC	214	180	0.010	1.01	31.84	0.01	0.30	0.07	OK	0.30	OK	0.14	0.00	1.15		1.01	1.13	1.15	OK
215	DP RD M4	DP RD M3	2	1	J		17.331	140.33	2.164	2.194	2.79	22.59	2.25	0.588	0.000	0.588	28	200	203	DWC	-578	320	0.010	0.76	23.88	0.02	0.40	0.10	OK	0.30	OK	0.05	0.00	0.85	0.85	0.80	1.31	1.39	OK
216	DP RD M3	DP RD M2	1	1	C		30	170.33	2.194	2.113	4.83	27.42	2.25	0.714	0.000	0.714	31	200	203	DWC	370	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.80		0.74	1.39	1.37	OK
217	DP RD M2	DP RD M1	1	1	C		30	200.33	2.113	2.105	4.83	32.25	2.25	0.840	0.000	0.840	33	200	203	DWC	3750	520	0.010	0.60	18.73	0.04	0.51	0.15	OK	0.30	OK	0.06	0.00	0.74		0.68	1.37	1.43	OK
218	DP RD M1	TP RD M14	1	1	C		21	221.33	2.105	2.258	3.38	35.63	2.25	0.928	0.000	0.928	35	200	203	DWC	-137	520	0.010	0.60	18.73	0.05	0.53	0.16	OK	0.32	OK	0.04	0.00	0.68		0.64	1.43	1.62	OK
219	TP RD M14	TP RD M13	2	1	J		31	3825.62	2.258	2.224	4.99	615.80	2.25	16.037	0.000	16.037	143	250	253	DWC	912	520	0.010	0.69	33.97	0.47	0.99	0.48	OK	0.68	OK	0.06	0.00	-1.85	-1.85	-1.91	4.11	4.13	OK
220	TP RD M13	TP RD M12	1	1	C		30	3855.62	2.224	1.945	4.83	620.63	2.25	16.162	0.000	16.162	144	250	253	DWC	108	520	0.010	0.69	33.97	0.48	0.99	0.49	OK	0.68	OK	0.06	0.00	-1.91		-1.97	4.13	3.92	OK
221	TP RD M12	TP RD M11	1	1	C		21	3876.62	1.945	2.447	3.38	624.01	2.25	16.250	0.000	16.250	144	250	253	DWC	-42	520	0.010	0.69	33.97	0.48	0.99	0.49	OK	0.68	OK	0.04	0.00	-1.97		-2.01	3.92	4.46	OK
222	TP RD M11	TP RD M10	1	1	C		30	3906.62	2.447	1.888	4.83	628.84	2.25	16.376	0.000	16.376	145	250	253	DWC	54	520	0.010	0.69	33.97	0.48	0.99	0.49	OK	0.68	OK	0.06	0.00	-2.01		-2.07	4.46	3.96	OK
223	TP RD M10	TP RD M10A	2	0	J	L	5	5909.07	1.888	1.888	0.80	951.17	2.25	24.770	0.000	24.770	178	300	304	DWC	0	700	0.010	0.67	47.61	0.52	1.01	0.52	OK	0.68	OK	0.01	0.00	-2.07	-2.07	-2.08	3.96	3.97	OK
							5909.07	5909.07				951.17																											

Elamkulam - Pipe Abstracts and Manhole Abstracts						
	Pipe Abstract					
		Depth in m				
Block	Pipe Size	up to 1.5	1.5 to 3	3.0to 4.5	4.5 to 6	Total
Block 5 to 13	200 mm DWC	60604	54255	8430	518	123806
	250 mm DWC	266	1237	3826	351	5681
	300 mm DWC	41	77	889	0	1007
	400HDPE	0	993	581	0	1574
	450HDPE	0	94	678	280	1052
	500HDPE	0	0	751	159	910
	550HDPE	15	0	157	476	648
	630HDPE	0	0	0	383	383
	Total	60926	56656	15312	2167	135062
		MH abstract				
Block	Depth	MH abstract				
Block 5 to 13	1.3	2412				
	1.75	1211				
	2.25	639				
	2.75	385				
	3.25	249				
	3.75	193				
	4.25	134				
	4.75	62				
	5.25	19				
	5.75	4				
Total		5308				

ELAMKULAM SYSTEM

List of Lift Man Holes as per the SNW design

BLOCK NAME	Man Holes		Manhole Type	Length in m	Ground Levels		FLOWS LPS		Sewer Dia	Sewer Dia	MOC	Invert Level in m		Depth of cutting in m		
	From	To			Starting Manhole	Ending Manhole	Total Flow	in MLD	m	mm		From	To	Starting Manhole	Ending manhole	Ave.Depth
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Block 05	JTA RD M65	JTA RD M64	L	23.00	2.341	2.440	5.341	0.461	0.200	200	DWC	-0.46	-0.52	2.72	2.86	2.79
Block 06	CHR RD M27L	CHR RD M26	L	21.00	1.802	2.012	12.447	1.075	0.200	200	DWC	-2.65	-2.71	4.44	4.51	4.475
Block 08	MPK LN RD M3L	MPK LN RD M2	L	30.00	0.976	1.923	29.680	2.564	0.200	200	DWC	-2.49	-2.52	3.25	3.50	3.375
Block 08	PNL RD M12	PNL RD M13	L	30.00	1.928	1.917	12.672	1.095	0.200	200	DWC	-2.64	-2.70	4.39	4.63	4.51
Block 12A	VBW L M9L	VBW L M8	L	12.00	1.887	2.025	18.210	1.573	0.200	200	DWC	-2.84	-2.86	4.74	4.75	4.745
Block 12A	AH LN RD M 18.4	VPY L M14	L	30.00	1.794	1.817	16.036	1.386	0.200	200	DWC	-1.66	-1.70	3.43	3.49	3.46
Block 05	SBC RD M1	STP	L	200.00	2.091	1.980	168.975	14.599	0.200	200	DWC	-2.47	-2.47	4.56	4.45	4.5055
Block 07	AT RD MI9A	EX.KWA WELL	L	180.00	1.400	1.750	11.743	1.015	0.200	200	DWC	-2.61	-2.61	4.01	4.36	4.185

ELAMKULAM SYSTEM															
DESIGN/INPUT DATA FOR LIFT MH										Output Results					
ABSTRACT OF LIFT MANHOLES, RISING MAINS & PUMPSET															
Block No.	Man Holes		Lift MH No.	Length in m	Ground Levels		Flow in MLD			Lift MH Size		Rising main		Pumpset	
	From	To			Starting Manhole	Ending Manhole	Initial	Inter	Ultimate	Dia. (m)	Depth (m)	Size	Length	Disc (lpm) x Head (m)	Capacity
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Block 05	JTA RD M65	JTA RD M64	LM-1	23.00	2.34	2.44	0.39	0.43	0.461	2.5	4.36	150 DI K9	23	295.1 lpm x 5 m Head	2
Block 06	CHR RD M27L	CHR RD M26	LM-2	21.00	1.80	2.01	0.90	0.99	1.075	2.5	6.01	150 DI K9	21	687.5 lpm x 7 m Head	2
Block 08	MPK LN RD M3L	MPK LN RD M2	LM-3	30.00	0.98	1.92	2.14	2.36	2.564	3.5	5	200 DI K9	30	1640.3 lpm x 7 m Head	5
Block 08	PNL RD M12	PNL RD M13	LM-4	30.00	1.93	1.92	0.91	1.01	1.095	2.5	6.13	150 DI K9	30	700.7 lpm x 7 m Head	2
Block 12A	VBW L M9L	VBW L M8	LM-5	12.00	1.89	2.03	1.31	1.45	1.573	3	6.25	200 DI K9	12	1006.3 lpm x 7 m Head	3
Block 12A	AH LN RD M 18.4	VPY L M14	LM-6	30.00	1.79	1.82	1.16	1.28	1.386	2.5	4.99	150 DI K9	30	886.8 lpm x 6 m Head	2
Block 05	SBC RD M1	STP	LM-7	200.00	2.09	1.98	12.18	13.45	14.599	5.5	6.06	400 DI K9	200	9340.3 lpm x 9 m Head	25
Block 07	AT RD MI9A	EX.KWA WELL	LM-8	180.00	1.40	1.75	0.85	0.94	1.015	2.5	5.51	200 DI K9	180	649.3 lpm x 7 m Head	2

PS: 1. The high discharge LiM7(Ult: 10138 lpm, Int:9340 lpm) is designed with 5 min detention time to minimise land footprint, as a special case bye-passing design guidelines, being nearer to STP as per KMRL request to opt for LiM in lieu of WW assembly otherwise it demands

2. Special arrangements shall be made to connect the overflow suitably without spills of sewage of overflow in the nearby vicinity, during emergencies . Adequate provisions shall be given in the Estimate

3. Special pumpset becomes necessary to take on the high discharge unscreened flows, in view of the site conditions wherein land is not available as conveyed by KMRL. However, alternative for any suitable land nearby could be intensively analysed

ELAMKULAM SYSTEM										
DESIGN/INPUT DATA FOR LIFT MH										
Sr. No	Description	Unit	Block 05	Block 06	Block 08	Block 08	Block 12A	Block 12A	Block 05	Block 07
			From JTA RD M65 to JTA RD M64	From CHR RD M27L to CHR RD M26	From MPK LN RD M3L to MPK LN RD M2	From PNL RD M12 to PNL RD M13	From VBW L M9L to VBW L M8	From AH LN RD M 18.4 to VPY L M14	From SBC RD M1 to STP	From AT RD MI9A to EX.KWA WELL
Lift Manhole No.			LM-1	LM-2	LM-3	LM-4	LM-5	LM-6	LM-7	LM-8
1	Initial	MLD	0.39	0.90	2.14	0.91	1.31	1.16	12.18	0.85
2	Intermediate Flow (for year 2050)	MLD	0.43	0.99	2.36	1.01	1.45	1.28	13.45	0.94
3	Peak Flow (for year 2050)	MLD	0.461	1.075	2.564	1.095	1.573	1.386	14.599	1.015
4	GL at Pumping Station Location	m	2.34	1.80	0.976	1.928	1.887	1.794	2.091	1.400
5	IL of Incoming Sewer	m	-0.520	-2.710	-2.520	-2.700	-2.860	-1.700	-2.470	-2.610
6	Length of Rising Main	m	23.000	21.000	30.000	30.000	12.000	30.000	200.000	180.000
7	Highest GL Enroute	m	2.440	2.012	1.923	1.917	2.025	1.817	1.980	1.750
8	Inner Dia of incoming sewer	m	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200
9	Residual Head	m	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
10	Suction Depth (Depth of Lift)	m	4.36	6.01	5.00	6.13	6.25	4.99	6.06	5.51
	Output values									
1	Average Flow	m ³ /hr	16.04	37.38	89.17	38.08	54.71	48.21	507.67	35.29
2	Peak Flow	m ³ /hr	17.71	41.25	98.42	42.04	60.38	53.21	560.42	38.96
3	Static head Required at Collector	m	5.46	7.22	6.95	7.12	7.39	6.01	6.95	6.86
Output Results										
	Size of Lift Well									
1	Dia (m)		2.50	2.50	3.50	2.50	3.00	2.50	5.50	2.50
2	Total Depth (m)		4.36	6.01	5.00	6.13	6.25	4.99	6.06	5.51
ECP-Pumping main & Pumpset										
1	Pumping main	Dia-mm	150 DI K9	150 DI K9	200 DI K9	150 DI K9	200 DI K9	150 DI K9	400 DI K9	200 DI K9
2	Pumpset	HP	2	2	5	2	3	2	25	2
3	Size of Discharge chamber	L x B x D	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m	1.8 m x 1.5 x 1.5 m

ELAMKULAM SYSTEM										
DESIGN/INPUT DATA FOR LIFT MH										
LIFT WELL CALCULATIONS										
Sr. No.	Description	Unit	Block 05	Block 06	Block 08	Block 08	Block 12A	Block 12A	Block 05	Block 07
			From JTA RD M65 to JTA RD M64	From CHR RD M27L to CHR RD M26	From MPK LN RD M3L to MPK LN RD M2	From PNL RD M12 to PNL RD M13	From VBW L M9L to VBW L M8	From AH LN RD M 18.4 to VPY L M14	From SBC RD M1 to STP	From AT RD MI9A to EX.KWA WELL
Lift MH No.			LM-1	LM-2	LM-3	LM-4	LM-5	LM-6	LM-7	LM-8
1	Average Flow	m ³ /hr	16.042	37.375	89.167	38.083	54.708	48.208		
2	Peak Flow	m ³ /hr	17.71	41.25	98.42	42.04	60.38	53.21	560.42	38.96
Lift well Size design										
1	Time for one pump cycle for ultimate design stage	min	10.00	10.00	10.00	10.00	10.00	10.00	5.00	10.00
2	Lift MH capacity required for ultimate design stage	m ³	0.738	1.719	4.101	1.752	2.516	2.217	11.675	1.623
3	Assumed sewage depth in Lift MH	m	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
4	Area required for Lift MH	m ²	1.476	3.438	8.201	3.503	5.031	4.434	23.351	3.247
5	Diameter required for Lift MH	m	1.371	2.092	3.231	2.112	2.531	2.376	5.453	2.033
6	Diameter provided for Lift MH	m	2.500	2.500	3.500	2.500	3.000	2.500	5.500	2.500
7	Actual provided Lift MH area	m ²	4.909	4.909	9.621	4.909	7.069	4.909	23.758	4.909
8	Actual provided Lift MH capacity	m ³	2.454	2.454	4.811	2.454	3.534	2.454	11.879	2.454
9	Ground level at Lift well site	m	2.341	1.802	0.976	1.928	1.887	1.794	2.091	1.400
10	Invert level of incoming sewer in Lift well	m	-0.52	-2.71	-2.52	-2.70	-2.86	-1.70	-2.47	-2.61
11	Difference between MWL in Lift well and incoming sewer	m	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
12	Maximum water level in Lift well (MWL)	m	-0.620	-2.810	-2.620	-2.800	-2.960	-1.800	-2.570	-2.710
13	Lowest water level in Lift well (LWL)	m	-1.120	-3.310	-3.120	-3.300	-3.460	-2.300	-3.070	-3.210
14	Required pump submergence depth	m	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
15	Lift well bed level	m	-2.020	-4.210	-4.020	-4.200	-4.360	-3.200	-3.970	-4.110
Well dimensions										
1	Total Lift well depth	m	4.360	6.010	5.000	6.130	6.250	4.990	6.060	5.510
2	Lift well diameter required	m	2.500	2.500	3.500	2.500	3.000	2.500	5.500	2.500
3	Lift well diameter to be provided	m	2.500	2.500	3.500	2.500	3.000	2.500	5.500	2.500

ELAMKULAM SYSTEM									
DESIGN OF PUMPING MAIN FROM From JTA RD M65 to JTA RD M64 of Block 05									
BASIC DATA						Combination	Pipes selected		
GL AT Wet well site	2.34	m				I	100 DI K9		
Top level of receiving chamber	2.44	m				II	150 DI K9		
Residual Head	2.00	m				III	200 DI K9		
TOTAL HGL REQUIRED AT END	4.44	m				IV	250 DI K9		
FOOT VALVE LEVEL	-0.52	m				V	300 DI K9		
Static head including Residual Head	4.96	m							
Number of reaches	1								
Length	23	m							

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Vclcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	2.34											4.65	2.31	
0	23	2.44	23	100	DI-K9	100	295	0.626	120	0.19	0.02	0.21	4.44	2.00	
									TOTAL	0.19	0.02	0.21			
Combination II															
	0	2.341											4.47	2.13	
0	23	2.44	23	150	DI-K9	100	295	0.278	866	0.03	0.00	0.03	4.44	2.00	
									TOTAL	0.03	0.00	0.03			
Combination III															
	0	2.341											4.45	2.11	
0	23	2.44	23	200	DI-K9	100	295	0.157	3516	0.01	0.00	0.01	4.44	2.00	
									TOTAL	0.01	0.00	0.01			
Combination IV															
	0	2.341											4.44	2.10	
0	23	2.44	23	250	DI-K9	100	295	0.1	10423	0	0.00	0.00	4.44	2.00	
									TOTAL	0	0.00	0.00			
Combination V															
	0	2.341											4.44	2.10	
0	23	2.44	23	300	DI-K9	100	295	0.07	25331	0	0.00	0.00	4.44	2.00	
									TOTAL	0	0.00	0.00			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.341											4.68	2.34	0
0	23	2.44	23	100	DI-K9	100	320	0.679	103	0.22	0.02	0.24	4.44	2.00	0
									TOTAL	0.22	0.02	0.24			
Combination II															
	0	2.341											4.47	2.13	0
0	23	2.44	23	150	DI-K9	100	320	0.302	745	0.03	0.00	0.03	4.44	2.00	0
									TOTAL	0.03	0.00	0.03			
Combination III															
	0	2.341											4.45	2.11	0
0	23	2.44	23	200	DI-K9	100	320	0.17	3024	0.01	0.00	0.01	4.44	2.00	0
									TOTAL	0.01	0.00	0.01			
Combination IV															
	0	2.341											4.44	2.10	0
0	23	2.44	23	250	DI-K9	100	320	0.109	8966	0	0.00	0.00	4.44	2.00	0
									TOTAL	0	0.00	0.00			
Combination V															
	0	2.341											4.44	2.10	0
0	23	2.44	23	300	DI-K9	100	320	0.075	21790	0	0.00	0.00	4.44	2.00	0
									TOTAL	0	0.00	0.00			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	4.96	0.19	0.019	6.00	0.22	0.022	6.00
II	4.96	0.03	0.003	5.00	0.03	0.003	5.00
III	4.96	0.01	0.001	5.00	0.01	0.001	5.00
IV	4.96	0	0	5.00	0	0	5.00
V	4.96	0	0	5.00	0	0	5.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	295	6.0	0.6	2.0	320	6	0.6	2.0
II	295	5.0	0.5	2.0	320	5	0.5	2.0
III	295	5.0	0.5	2.0	320	5	0.5	2.0
IV	295	5.0	0.5	2.0	320	5	0.5	2.0
V	295	5.0	0.5	2.0	320	5	0.5	2.0

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	2	110000	220000	2	#####	220000	52666	272666
II	2	110000	220000	2	#####	220000	52666	272666
III	2	110000	220000	2	#####	220000	52666	272666
IV	2	110000	220000	2	#####	220000	52666	272666
V	2	110000	220000	2	#####	220000	52666	272666

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		8.00							
Comb inatio	Intermediate Stage				Ultimate Stage						Total cost			
	BHP	Units	Cost	Capitalised	BHP	Units	Cost	Capitalised cost	Equ.cost					
I	1	3594	28752	262479	1	3921	31368	286361	68553	331032				
II	0	3006	24048	219536	1	3267	26136	238598	57118	276655				
III	0	3006	24048	219536	1	3267	26136	238598	57118	276655				
IV	0	3006	24048	219536	1	3267	26136	238598	57118	276655				
V	0	3006	24048	219536	1	3267	26136	238598	57118	276655				

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/ m	Total cost
I	100 DI K9	23	1289	29647
		TOTAL		29647
II	150 DI K9	23	1870	43010
		TOTAL		43010
III	200 DI K9	23	2507	57661
		TOTAL		57661
IV	250 DI K9	23	3367	77441
		TOTAL		77441
V	300 DI K9	23	4251	97773
		TOTAL		97773

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	29647	272666	302313
II	43010	272666	315676
III	57661	272666	330327
IV	77441	272666	350107
V	97773	272666	370439

TABLE 8. Cost of installation and maintenance			
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance
1	2	3	4. (2 + 3)
I	302313	331032	633345
II	315676	276655	592331
III	330327	276655	606982
IV	350107	276655	626762
V	370439	276655	647094

Pipe Size and Type	Inter.	Ult.
	Pump set Cap.	Pump set Cap.
5.	6.	7.
100 DI K9	2	2
150 DI K9	2	2
200 DI K9	2	2
250 DI K9	2	2
300 DI K9	2	2

Hence Combination II consisting of 150 DI K9 23 m x 2 HP is found to be economical

Propose 150 DI K9 x 2 HP Non clog pumpset

ELAMKULAM SYSTEM		
From JTA RD M65 to JTA RD M64		
Design of Discharge Chamber		
Diameter	150 DI K9	mm
Peak flow from 150 DI K9m dia Force main	5.34	lps
Size of Discharge Chamber -		
Width of chamber =	1.50	m
Length of chamber =	1.80	m
Assuming width of channel =	1.50	m
Assuming effective length of travel inside the channel =	1.80	m
Assuming a detention time of 2 sec,		
Volume required =	0.011	cu.m
Depth of Flow =	0.004	m
Assume Depth of flow as	0.020	m
Mean Hydraulic Radius, m = Area / Wetted Perimeter		
	$m = A/P = 1.5 \times 0.02 / (1.5 + 2 \times 0.02)$	
	0.019	m
Assuming n = 0.014 for concrete channels and using Manning's formula		
$v = (1/n)m^{2/3}i^{1/2}$		
Providing a slope, i =	1 in	200
Velocity, V =	0.37	m/s
Cross-sectional Area, A =	1.5 x 0.02	
	0.03	sq.m
Carrying capacity, Q =	A x V	
	10.970	lps
	Hence Safe	

Discharge MH GL		m
Discharge MH IL		m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	1.80	1.50	1.50
Provide Discharge chamber of size 1.8 m x 1.5 x 1.5 m			

0.01

Hence Safe

ELAMKULAM SYSTEM									
DESIGN OF PUMPING MAIN FROM From CHR RD M27L to CHR RD M26 of Block 06									
BASIC DATA						Combination	Pipes selected		
GL AT Wet well site	1.80	m				I	100 DI K9		
Top level of receiving chamber	2.01	m				II	150 DI K9		
Residual Head	2.00	m				III	200 DI K9		
TOTAL HGL REQUIRED AT END	4.01	m				IV	250 DI K9		
FOOT VALVE LEVEL	-2.71	m				V	300 DI K9		
Static head including Residual Head	6.72	m							
Number of reaches	1								
Length	21	m							

INTERMEDIATE STAGE																
TABLE1. FRICTION LOSS																
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Vclcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS	
Start	End			Size in mm	Type &	C' value										
Combination I																
	0	1.80											4.94	3.13		
0	21	2.01	21	100	DI-K9	100	688	1.459	25	0.84	0.08	0.92	4.01	2.00		
									TOTAL	0.84	0.08	0.92				
Combination II																
	0	1.802											4.14	2.34		
0	21	2.012	21	150	DI-K9	100	688	0.648	181	0.12	0.01	0.13	4.01	2.00		
									TOTAL	0.12	0.01	0.13				
Combination III																
	0	1.802											4.05	2.24		
0	21	2.012	21	200	DI-K9	100	688	0.365	734	0.03	0.00	0.03	4.01	2.00		
									TOTAL	0.03	0.00	0.03				
Combination IV																
	0	1.802											4.02	2.22		
0	21	2.012	21	250	DI-K9	100	688	0.233	2177	0.01	0.00	0.01	4.01	2.00		
									TOTAL	0.01	0.00	0.01				
Combination V																
	0	1.802											4.01	2.21		
0	21	2.012	21	300	DI-K9	100	688	0.162	5290	0	0.00	0.00	4.01	2.00		

									TOTAL	0	0.00	0.00			
ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Vclcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	1.802											5.06	3.26	0
0	21	2.012	21	100	DI-K9	100	747	1.584	22	0.95	0.10	1.05	4.01	2.00	0
									TOTAL	0.95	0.10	1.05			
Combination II															
	0	1.802											4.17	2.36	0
0	21	2.012	21	150	DI-K9	100	747	0.704	155	0.14	0.01	0.15	4.01	2.00	0
									TOTAL	0.14	0.01	0.15			
Combination III															
	0	1.802											4.05	2.24	0
0	21	2.012	21	200	DI-K9	100	747	0.396	630	0.03	0.00	0.03	4.01	2.00	0
									TOTAL	0.03	0.00	0.03			
Combination IV															
	0	1.802											4.02	2.22	0
0	21	2.012	21	250	DI-K9	100	747	0.253	1869	0.01	0.00	0.01	4.01	2.00	0
									TOTAL	0.01	0.00	0.01			
Combination V															
	0	1.802											4.01	2.21	0
0	21	2.012	21	300	DI-K9	100	747	0.176	4542	0	0.00	0.00	4.01	2.00	0
									TOTAL	0	0.00	0.00			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	6.722	0.84	0.084	8.00	0.95	0.095	8.00
II	6.722	0.12	0.012	7.00	0.14	0.014	7.00
III	6.722	0.03	0.003	7.00	0.03	0.003	7.00
IV	6.722	0.01	0.001	7.00	0.01	0.001	7.00
V	6.722	0	0	7.00	0	0	7.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	688	8	1.72	2.0	747	8	1.87	2.0
II	688	7	1.51	2.0	747	7	1.64	2.0
III	688	7	1.51	2.0	747	7	1.64	2.0
IV	688	7	1.51	2.0	747	7	1.64	2.0
V	688	7	1.51	2.0	747	7	1.64	2.0

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	2	110000	220000	2	#####	220000	52666	272666
II	2	110000	220000	2	#####	220000	52666	272666
III	2	110000	220000	2	#####	220000	52666	272666
IV	2	110000	220000	2	#####	220000	52666	272666
V	2	110000	220000	2	#####	220000	52666	272666

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		8.00							
Comb inatio	Intermediate Stage				Ultimate Stage						Total cost			
	BHP	Units	Cost	Capitalised	BHP	Units	Cost	Capitalised cost	Equ.cost					
I	2	11240	89920	820887	2	12220	97760	892459	213648	1034535				
II	2	9868	78944	720687	2	10717	85736	782691	187370	908057				
III	2	9868	78944	720687	2	10717	85736	782691	187370	908057				
IV	2	9868	78944	720687	2	10717	85736	782691	187370	908057				
V	2	9868	78944	720687	2	10717	85736	782691	187370	908057				

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/ m	Total cost
I	100 DI K9	21	1289	27069
		TOTAL		27069
II	150 DI K9	21	1870	39270
		TOTAL		39270
III	200 DI K9	21	2507	52647
		TOTAL		52647
IV	250 DI K9	21	3367	70707
		TOTAL		70707
V	300 DI K9	21	4251	89271
		TOTAL		89271

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	27069	272666	299735
II	39270	272666	311936
III	52647	272666	325313
IV	70707	272666	343373
V	89271	272666	361937

TABLE 8. Cost of installation and maintenance

Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	2	3	4. (2 + 3)	5.	6.	7.
I	299735	1034535	1334270	100 DI K9	2	2
II	311936	908057	1219993	150 DI K9	2	2
III	325313	908057	1233370	200 DI K9	2	2
IV	343373	908057	1251430	250 DI K9	2	2
V	361937	908057	1269994	300 DI K9	2	2

Hence Combination II consisting of 150 DI K9 21 m x 2 HP is found to be economical

Propose 150 DI K9 x 2 HP Non clog pumpset

ELAMKULAM SYSTEM		
From JTA RD M65 to JTA RD M64		
Design of Discharge Chamber		
Diameter	150 DI K9	mm
Peak flow from 150 DI K9m dia Force main	12.44	lps
Size of Discharge Chamber -		
Width of chamber =	1.50	m
Length of chamber =	1.80	m
Assuming width of channel =	1.50	m
Assuming effective length of travel inside the channel =	1.80	m
Assuming a detention time of 2 sec,		
Volume required =	0.025	cu.m
Depth of Flow =	0.009	m
Assume Depth of flow as	0.030	m
Mean Hydraulic Radius, $m = \text{Area} / \text{Wetted Perimeter}$		
	$m = A/P = 1.5 \times 0.03 / (1.5 + 2 \times 0.03)$	
	0.029	m
Assuming $n = 0.014$ for concrete channels and using Manning's formula		
$v = (1/n) m^{2/3} i^{1/2}$		
Providing a slope, $i =$	1 in 200	
Velocity, $V =$	0.48	m/s
Cross-sectional Area, $A =$	1.5×0.03	
	0.045	sq.m
Carrying capacity, $Q =$	$A \times V$	
	21.378	lps
	Hence Safe	

Discharge MH GL		m
Discharge MH IL		m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	1.80	1.50	1.50
Provide Discharge chamber of size 1.8 m x 1.5 x 1.5 m			

0.02

Hence Safe

ELAMKULAM SYSTEM				
SIGN OF PUMPING MAIN FROM From MPK LN RD M3L to MPK LN RD M2 of Block				
BASIC DATA			Combination	Pipes selected
GL AT Wet well site	0.98	m	I	100 DI K9
Top level of receiving chamber	1.92	m	II	150 DI K9
Residual Head	2.00	m	III	200 DI K9
TOTAL HGL REQUIRED AT END	3.92	m	IV	250 DI K9
FOOT VALVE LEVEL	-2.52	m	V	300 DI K9
Static head including Residual Head	6.44	m		
Number of reaches	1			
Length	30	m		

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Vclcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	0.98											10.52	9.55	
0	30	1.92	30	100	DI-K9	100	1640	3.481	5	6	0.60	6.60	3.92	2.00	
									TOTAL	6	0.60	6.60			
Combination II															
	0	0.976											4.84	3.86	
0	30	1.923	30	150	DI-K9	100	1640	1.547	36	0.83	0.08	0.91	3.92	2.00	
									TOTAL	0.83	0.08	0.91			
Combination III															
	0	0.976											4.14	3.17	
0	30	1.923	30	200	DI-K9	100	1640	0.87	147	0.2	0.02	0.22	3.92	2.00	
									TOTAL	0.2	0.02	0.22			
Combination IV															
	0	0.976											4.00	3.02	
0	30	1.923	30	250	DI-K9	100	1640	0.557	435	0.07	0.01	0.08	3.92	2.00	
									TOTAL	0.07	0.01	0.08			
Combination V															
	0	0.976											3.96	2.98	
0	30	1.923	30	300	DI-K9	100	1640	0.387	1057	0.03	0.00	0.03	3.92	2.00	
									TOTAL	0.03	0.00	0.03			

ULTIMATE STAGE																
TABLE1. FRICTION LOSS																
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS	
Start	End			Size in mm	Type & Class	C' value										
Combination I																
	0	0.976											12.17	11.20	0	
0	30	1.923	30	100	DI-K9	100	1781	3.779	4	7.5	0.75	8.25	3.92	2.00	0	
									TOTAL	7.5	0.75	8.25				
Combination II																
	0	0.976											4.99	4.01	0	
0	30	1.923	30	150	DI-K9	100	1781	1.679	31	0.97	0.10	1.07	3.92	2.00	0	
									TOTAL	0.97	0.10	1.07				
Combination III																
	0	0.976											4.19	3.21	0	
0	30	1.923	30	200	DI-K9	100	1781	0.945	126	0.24	0.02	0.26	3.92	2.00	0	
									TOTAL	0.24	0.02	0.26				
Combination IV																
	0	0.976											4.01	3.04	0	
0	30	1.923	30	250	DI-K9	100	1781	0.605	374	0.08	0.01	0.09	3.92	2.00	0	
									TOTAL	0.08	0.01	0.09				
Combination V																
	0	0.976											3.96	2.98	0	
0	30	1.923	30	300	DI-K9	100	1781	0.42	908	0.03	0.00	0.03	3.92	2.00	0	
									TOTAL	0.03	0.00	0.03				

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	6.443	6	0.6	14.00	7.5	0.75	15.00
II	6.443	0.83	0.083	8.00	0.97	0.097	8.00
III	6.443	0.2	0.02	7.00	0.24	0.024	7.00
IV	6.443	0.07	0.007	7.00	0.08	0.008	7.00
V	6.443	0.03	0.003	7.00	0.03	0.003	7.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	1640	14.00	7.19	7.5	1781	15.00	8.36	10.0
II	1640	8.00	4.11	5.0	1781	8.00	4.46	5.0
III	1640	7.00	3.59	5.0	1781	7.00	3.90	5.0
IV	1640	7.00	3.59	5.0	1781	7.00	3.90	5.0
V	1640	7.00	3.59	5.0	1781	7.00	3.90	5.0

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	8	63000	472500	10	63000	630000	150817	623317
II	5	75000	375000	5	75000	375000	89772	464772
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		8.00							
Combination	Intermediate Stage				Ultimate Stage					Total cost				
	BHP	Units	Cost	Capitalised	BHP	Units	Cost	Capitalised cost	Equ.cost					
I	7	46986	375888	3431514	8	54632	437056	3989921	955155	4386669				
II	4	26859	214872	1961585	4	29146	233168	2128611	509572	2471157				
III	4	23461	187688	1713420	4	25486	203888	1861311	445583	2159003				
IV	4	23461	187688	1713420	4	25486	203888	1861311	445583	2159003				
V	4	23461	187688	1713420	4	25486	203888	1861311	445583	2159003				

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/ m	Total cost
I	100 DI K9	30	1289	38670
		TOTAL		38670
II	150 DI K9	30	1870	56100
		TOTAL		56100
III	200 DI K9	30	2507	75210
		TOTAL		75210
IV	250 DI K9	30	3367	101010
		TOTAL		101010
V	300 DI K9	30	4251	127530
		TOTAL		127530

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	38670	623317	661987
II	56100	464772	520872
III	75210	464772	539982
IV	101010	464772	565782
V	127530	464772	592302

TABLE 8. Cost of installation and maintenance			
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance
1	2	3	4. (2 + 3)
I	661987	4386669	5048656
II	520872	2471157	2992029
III	539982	2159003	2698985
IV	565782	2159003	2724785
V	592302	2159003	2751305

Pipe Size and Type	Inter.	Ult.
	Pump set Cap.	Pump set Cap.
5.	6.	7.
100 DI K9	8	10
150 DI K9	5	5
200 DI K9	5	5
250 DI K9	5	5
300 DI K9	5	5

Hence Combination III consisting of 200 DI K9 30 m x 5 HP is found to be economical

Propose 200 DI K9 x 5 HP Non clog pumpset

ELAMKULAM SYSTEM		
From JTA RD M65 to JTA RD M64		
Design of Discharge Chamber		
Diameter	200 DI K9	mm
Peak flow from 200 DI K9m dia Force main	29.68	lps
Size of Discharge Chamber -		
Width of chamber =	1.50	m
Length of chamber =	1.80	m
Assuming width of channel =	1.50	m
Assuming effective length of travel inside the channel =	1.80	m
Assuming a detention time of 2 sec,		
Volume required =	0.059	cu.m
Depth of Flow =	0.022	m
Assume Depth of flow as	0.040	m
Mean Hydraulic Radius, $m = \text{Area} / \text{Wetted Perimeter}$		
	$m = A/P = 1.5 \times 0.04 / (1.5 + 2 \times 0.04)$	
	0.038	m
Assuming $n = 0.014$ for concrete channels and using Manning's formula		
$v = (1/n)m^{2/3}i^{1/2}$		
Providing a slope, $i =$	1 in 200	
Velocity, $V =$	0.57	m/s
Cross-sectional Area, $A =$	1.5×0.04	
	0.06	sq.m
Carrying capacity, $Q =$	$A \times V$	
	34.238	lps
	Hence Safe	

Discharge MH GL		m
Discharge MH IL		m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	1.80	1.50	1.50
Provide Discharge chamber of size 1.8 m x 1.5 x 1.5 m			

0.01

Hence Safe

ELAMKULAM SYSTEM				
DESIGN OF PUMPING MAIN FROM From PNL RD M12 to PNL RD M13 of Block 08				
BASIC DATA			Combination	Pipes selected
GL AT Wet well site	1.93	m	I	100 DI K9
Top level of receiving chamber	1.92	m	II	150 DI K9
Residual Head	2.00	m	III	200 DI K9
TOTAL HGL REQUIRED AT END	3.92	m	IV	250 DI K9
FOOT VALVE LEVEL	-2.70	m	V	300 DI K9
Static head including Residual Head	6.62	m		
Number of reaches	1			
Length	30	m		

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Vclcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	1.93											5.29	3.36	
0	30	1.92	30	100	DI-K9	100	701	1.487	24	1.25	0.13	1.38	3.92	2.00	
									TOTAL	1.25	0.13	1.38			
Combination II															
	0	1.928											4.10	2.18	
0	30	1.917	30	150	DI-K9	100	701	0.661	175	0.17	0.02	0.19	3.92	2.00	
									TOTAL	0.17	0.02	0.19			
Combination III															
	0	1.928											3.96	2.03	
0	30	1.917	30	200	DI-K9	100	701	0.372	709	0.04	0.00	0.04	3.92	2.00	
									TOTAL	0.04	0.00	0.04			
Combination IV															
	0	1.928											3.93	2.00	
0	30	1.917	30	250	DI-K9	100	701	0.238	2101	0.01	0.00	0.01	3.92	2.00	
									TOTAL	0.01	0.00	0.01			
Combination V															
	0	1.928											3.93	2.00	
0	30	1.917	30	300	DI-K9	100	701	0.165	5107	0.01	0.00	0.01	3.92	2.00	
									TOTAL	0.01	0.00	0.01			

ULTIMATE STAGE																
TABLE1. FRICTION LOSS																
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS	
Start	End			Size in mm	Type & Class	C' value										
Combination I																
	0	1.928											5.49	3.56	0	
0	30	1.917	30	100	DI-K9	100	760	1.614	21	1.43	0.14	1.57	3.92	2.00	0	
									TOTAL	1.43	0.14	1.57				
Combination II																
	0	1.928											4.14	2.21	0	
0	30	1.917	30	150	DI-K9	100	760	0.717	150	0.2	0.02	0.22	3.92	2.00	0	
									TOTAL	0.2	0.02	0.22				
Combination III																
	0	1.928											3.97	2.04	0	
0	30	1.917	30	200	DI-K9	100	760	0.403	609	0.05	0.01	0.06	3.92	2.00	0	
									TOTAL	0.05	0.01	0.06				
Combination IV																
	0	1.928											3.94	2.01	0	
0	30	1.917	30	250	DI-K9	100	760	0.258	1806	0.02	0.00	0.02	3.92	2.00	0	
									TOTAL	0.02	0.00	0.02				
Combination V																
	0	1.928											3.93	2.00	0	
0	30	1.917	30	300	DI-K9	100	760	0.179	4389	0.01	0.00	0.01	3.92	2.00	0	
									TOTAL	0.01	0.00	0.01				

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	6.617	1.25	0.125	8.00	1.43	0.143	9.00
II	6.617	0.17	0.017	7.00	0.2	0.02	7.00
III	6.617	0.04	0.004	7.00	0.05	0.005	7.00
IV	6.617	0.01	0.001	7.00	0.02	0.002	7.00
V	6.617	0.01	0.001	7.00	0.01	0.001	7.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	701	8	1.75	2.0	760	9	2.14	3.0
II	701	7	1.54	2.0	760	7	1.67	2.0
III	701	7	1.54	2.0	760	7	1.67	2.0
IV	701	7	1.54	2.0	760	7	1.67	2.0
V	701	7	1.54	2.0	760	7	1.67	2.0

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	2	110000	220000	3	75000	225000	53863	273863
II	2	110000	220000	2	#####	220000	52666	272666
III	2	110000	220000	2	#####	220000	52666	272666
IV	2	110000	220000	2	#####	220000	52666	272666
V	2	110000	220000	2	#####	220000	52666	272666

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		8.00							
Comb inatio	Intermediate Stage				Ultimate Stage						Total cost			
	BHP	Units	Cost	Capitalised	BHP	Units	Cost	Capitalised cost	Equ.cost					
I	2	11436	91488	835202	2	13985	111880	1021362	244506	1079708				
II	2	10064	80512	735001	2	10913	87304	797006	190797	925798				
III	2	10064	80512	735001	2	10913	87304	797006	190797	925798				
IV	2	10064	80512	735001	2	10913	87304	797006	190797	925798				
V	2	10064	80512	735001	2	10913	87304	797006	190797	925798				

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/ m	Total cost
I	100 DI K9	30	1289	38670
		TOTAL		38670
II	150 DI K9	30	1870	56100
		TOTAL		56100
III	200 DI K9	30	2507	75210
		TOTAL		75210
IV	250 DI K9	30	3367	101010
		TOTAL		101010
V	300 DI K9	30	4251	127530
		TOTAL		127530

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	38670	273863	312533
II	56100	272666	328766
III	75210	272666	347876
IV	101010	272666	373676
V	127530	272666	400196

TABLE 8. Cost of installation and maintenance			
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance
1	2	3	4. (2 + 3)
I	312533	1079708	1392241
II	328766	925798	1254564
III	347876	925798	1273674
IV	373676	925798	1299474
V	400196	925798	1325994

Pipe Size and Type	Inter.	Ult.
	Pump set Cap.	Pump set Cap.
5.	6.	7.
100 DI K9	2	3
150 DI K9	2	2
200 DI K9	2	2
250 DI K9	2	2
300 DI K9	2	2

Hence Combination II consisting of 150 DI K9 30 m x 2 HP is found to be economical
Propose 150 DI K9 x 2 HP Non clog pumpset

ELAMKULAM SYSTEM		
From PNL RD M12 to PNL RD M13		
Design of Discharge Chamber		
Diameter	150 DI K9	mm
Peak flow from 150 DI K9m dia Force main	12.67	lps
Size of Discharge Chamber -		
Width of chamber =	1.50	m
Length of chamber =	1.80	m
Assuming width of channel =	1.50	m
Assuming effective length of travel inside the channel =	1.80	m
Assuming a detention time of 2 sec,		
Volume required =	0.025	cu.m
Depth of Flow =	0.009	m
Assume Depth of flow as	0.020	m
Mean Hydraulic Radius, m = Area / Wetted Perimeter	m = A/P = 1.5x0.02/(1.5+2x0.02)	
	0.019	m
Assuming n = 0.014 for concrete channels and using Manning's formula		
$v = (1/n)m^{2/3}i^{1/2}$		
Providing a slope, i =	1 in	200
Velocity, V =	0.37	m/s
Cross-sectional Area, A =	1.5x0.02	
	0.03	sq.m
Carrying capacity, Q =	A x V	
	10.970	lps
	Sorry, Unsafe	

Discharge MH GL		m
Discharge MH IL		m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	1.80	1.50	1.50
Provide Dischrge chamber of size 1.8 m x 1.5 x 1.5 m			

0.01

Sorry, Unsafe

ELAMKULAM SYSTEM				
DESIGN OF PUMPING MAIN FROM From VBW L M9L to VBW L M8 of Block 12A				
BASIC DATA			Combination	Pipes selected
GL AT Wet well site	1.89	m	I	100 DI K9
Top level of receiving chamber	2.03	m	II	150 DI K9
Residual Head	2.00	m	III	200 DI K9
TOTAL HGL REQUIRED AT END	4.03	m	IV	250 DI K9
FOOT VALVE LEVEL	-2.86	m	V	300 DI K9
Static head including Residual Head	6.89	m		
Number of reaches	1			
Length	12	m		

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Vclcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	1.89											5.13	3.24	
0	12	2.03	12	100	DI-K9	100	1006	2.135	12	1	0.10	1.10	4.03	2.00	
									TOTAL	1	0.10	1.10			
Combination II															
	0	1.887											4.17	2.28	
0	12	2.025	12	150	DI-K9	100	1006	0.949	89	0.13	0.01	0.14	4.03	2.00	
									TOTAL	0.13	0.01	0.14			
Combination III															
	0	1.887											4.06	2.17	
0	12	2.025	12	200	DI-K9	100	1006	0.534	363	0.03	0.00	0.03	4.03	2.00	
									TOTAL	0.03	0.00	0.03			
Combination IV															
	0	1.887											4.04	2.15	
0	12	2.025	12	250	DI-K9	100	1006	0.342	1075	0.01	0.00	0.01	4.03	2.00	
									TOTAL	0.01	0.00	0.01			
Combination V															
	0	1.887											4.03	2.14	
0	12	2.025	12	300	DI-K9	100	1006	0.237	2613	0	0.00	0.00	4.03	2.00	
									TOTAL	0	0.00	0.00			

ULTIMATE STAGE																
TABLE1. FRICTION LOSS																
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS	
Start	End			Size in mm	Type & Class	C' value										
Combination I																
	0	1.887											5.22	3.34	0	
0	12	2.025	12	100	DI-K9	100	1092	2.318	11	1.09	0.11	1.20	4.03	2.00	0	
									TOTAL	1.09	0.11	1.20				
Combination II																
	0	1.887											4.20	2.31	0	
0	12	2.025	12	150	DI-K9	100	1092	1.03	77	0.16	0.02	0.18	4.03	2.00	0	
									TOTAL	0.16	0.02	0.18				
Combination III																
	0	1.887											4.07	2.18	0	
0	12	2.025	12	200	DI-K9	100	1092	0.58	311	0.04	0.00	0.04	4.03	2.00	0	
									TOTAL	0.04	0.00	0.04				
Combination IV																
	0	1.887											4.04	2.15	0	
0	12	2.025	12	250	DI-K9	100	1092	0.371	923	0.01	0.00	0.01	4.03	2.00	0	
									TOTAL	0.01	0.00	0.01				
Combination V																
	0	1.887											4.04	2.15	0	
0	12	2.025	12	300	DI-K9	100	1092	0.258	2244	0.01	0.00	0.01	4.03	2.00	0	
									TOTAL	0.01	0.00	0.01				

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	6.885	1	0.1	8.00	1.09	0.109	9.00
II	6.885	0.13	0.013	8.00	0.16	0.016	8.00
III	6.885	0.03	0.003	7.00	0.04	0.004	7.00
IV	6.885	0.01	0.001	7.00	0.01	0.001	7.00
V	6.885	0	0	7.00	0.01	0.001	7.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	1006	8	2.52	3.0	1092	9.0	3.08	5.0
II	1006	8	2.52	3.0	1092	8.0	2.74	3.0
III	1006	7	2.21	3.0	1092	7.0	2.39	3.0
IV	1006	7	2.21	3.0	1092	7.0	2.39	3.0
V	1006	7	2.21	3.0	1092	7.0	2.39	3.0

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	3	75000	225000	5	75000	375000	89772	314772
II	3	75000	225000	3	75000	225000	53863	278863
III	3	75000	225000	3	75000	225000	53863	278863
IV	3	75000	225000	3	75000	225000	53863	278863
V	3	75000	225000	3	75000	225000	53863	278863

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		8.00							
Comb inatio	Intermediate Stage				Ultimate Stage					Total cost				
	BHP	Units	Cost	Capitalised	BHP	Units	Cost	Capitalised cost	Equ.cost					
I	3	16468	131744	1202702	3	20128	161024	1470002	351907	1554609				
II	3	16468	131744	1202702	3	17906	143248	1307723	313059	1515761				
III	2	14442	115536	1054738	2	15619	124952	1140697	273074	1327812				
IV	2	14442	115536	1054738	2	15619	124952	1140697	273074	1327812				
V	2	14442	115536	1054738	2	15619	124952	1140697	273074	1327812				

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/ m	Total cost
I	100 DI K9	12	1289	15468
		TOTAL		15468
II	150 DI K9	12	1870	22440
		TOTAL		22440
III	200 DI K9	12	2507	30084
		TOTAL		30084
IV	250 DI K9	12	3367	40404
		TOTAL		40404
V	300 DI K9	12	4251	51012
		TOTAL		51012

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	15468	314772	330240
II	22440	278863	301303
III	30084	278863	308947
IV	40404	278863	319267
V	51012	278863	329875

TABLE 8. Cost of installation and maintenance

Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	2	3	4. (2 + 3)	5.	6.	7.
I	330240	1554609	1884849	100 DI K9	3	5
II	301303	1515761	1817064	150 DI K9	3	3
III	308947	1327812	1636759	200 DI K9	3	3
IV	319267	1327812	1647079	250 DI K9	3	3
V	329875	1327812	1657687	300 DI K9	3	3

Hence Combination III consisting of 200 DI K9 12 m x 3 HP is found to be economical

Propose 200 DI K9 x 3 HP Non clog pumpset

ELAMKULAM SYSTEM		
From JTA RD M65 to JTA RD M64		
Design of Discharge Chamber		
Diameter	200 DI K9	mm
Peak flow from 200 DI K9m dia Force main	18.21	lps
Size of Discharge Chamber -		
Width of chamber =	1.50	m
Length of chamber =	1.80	m
Assuming width of channel =	1.50	m
Assuming effective length of travel inside the channel =	1.80	m
Assuming a detention time of 2 sec,		
Volume required =	0.036	cu.m
Depth of Flow =	0.013	m
Assume Depth of flow as	0.030	m
Mean Hydraulic Radius, $m = \text{Area} / \text{Wetted Perimeter}$		
	$m = A/P = 1.5 \times 0.03 / (1.5 + 2 \times 0.03)$	
	0.029	m
Assuming $n = 0.014$ for concrete channels and using Manning's formula		
$v = (1/n)m^{2/3}i^{1/2}$		
Providing a slope, $i =$	1 in 200	
Velocity, $V =$	0.48	m/s
Cross-sectional Area, $A =$	1.5×0.03	
	0.045	sq.m
Carrying capacity, $Q =$	$A \times V$	
	21.378	lps
	Hence Safe	

Discharge MH GL		m
Discharge MH IL		m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	1.80	1.50	1.50
Provide Discharge chamber of size 1.8 m x 1.5 x 1.5 m			

0.01

Hence Safe

ELAMKULAM SYSTEM				
DESIGN OF PUMPING MAIN FROM From AH LN RD M 18.4 to VPY L M14 of Block 12				
BASIC DATA			Combination	Pipes selected
GL AT Wet well site	1.79	m	I	100 DI K9
Top level of receiving chamber	1.82	m	II	150 DI K9
Residual Head	2.00	m	III	200 DI K9
TOTAL HGL REQUIRED AT END	3.82	m	IV	250 DI K9
FOOT VALVE LEVEL	-1.70	m	V	300 DI K9
Static head including Residual Head	5.52	m		
Number of reaches	1			
Length	30	m		

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Vclcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	1.79											5.89	4.09	
0	30	1.82	30	100	DI-K9	100	887	1.882	16	1.88	0.19	2.07	3.82	2.00	
									TOTAL	1.88	0.19	2.07			
Combination II															
	0	1.794											4.11	2.32	
0	30	1.817	30	150	DI-K9	100	887	0.836	113	0.27	0.03	0.30	3.82	2.00	
									TOTAL	0.27	0.03	0.30			
Combination III															
	0	1.794											3.89	2.10	
0	30	1.817	30	200	DI-K9	100	887	0.47	458	0.07	0.01	0.08	3.82	2.00	
									TOTAL	0.07	0.01	0.08			
Combination IV															
	0	1.794											3.84	2.05	
0	30	1.817	30	250	DI-K9	100	887	0.301	1359	0.02	0.00	0.02	3.82	2.00	
									TOTAL	0.02	0.00	0.02			
Combination V															
	0	1.794											3.83	2.03	
0	30	1.817	30	300	DI-K9	100	887	0.209	3302	0.01	0.00	0.01	3.82	2.00	
									TOTAL	0.01	0.00	0.01			

ULTIMATE STAGE																
TABLE1. FRICTION LOSS																
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS	
Start	End			Size in mm	Type & Class	C' value										
Combination I																
	0	1.794											6.36	4.56	0	
0	30	1.817	30	100	DI-K9	100	963	2.042	13	2.31	0.23	2.54	3.82	2.00	0	
									TOTAL	2.31	0.23	2.54				
Combination II																
	0	1.794											4.16	2.36	0	
0	30	1.817	30	150	DI-K9	100	963	0.908	97	0.31	0.03	0.34	3.82	2.00	0	
									TOTAL	0.31	0.03	0.34				
Combination III																
	0	1.794											3.91	2.11	0	
0	30	1.817	30	200	DI-K9	100	963	0.511	394	0.08	0.01	0.09	3.82	2.00	0	
									TOTAL	0.08	0.01	0.09				
Combination IV																
	0	1.794											3.85	2.06	0	
0	30	1.817	30	250	DI-K9	100	963	0.327	1167	0.03	0.00	0.03	3.82	2.00	0	
									TOTAL	0.03	0.00	0.03				
Combination V																
	0	1.794											3.83	2.03	0	
0	30	1.817	30	300	DI-K9	100	963	0.227	2837	0.01	0.00	0.01	3.82	2.00	0	
									TOTAL	0.01	0.00	0.01				

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	5.517	1.88	0.188	8.00	2.31	0.231	9.00
II	5.517	0.27	0.027	6.00	0.31	0.031	6.00
III	5.517	0.07	0.007	6.00	0.08	0.008	6.00
IV	5.517	0.02	0.002	6.00	0.03	0.003	6.00
V	5.517	0.01	0.001	6.00	0.01	0.001	6.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	887	8	2.22	3.0	963	9	2.71	3.0
II	887	6	1.67	2.0	963	6	1.81	2.0
III	887	6	1.67	2.0	963	6	1.81	2.0
IV	887	6	1.67	2.0	963	6	1.81	2.0
V	887	6	1.67	2.0	963	6	1.81	2.0

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	3	75000	225000	3	75000	225000	53863	278863
II	2	110000	220000	2	#####	220000	52666	272666
III	2	110000	220000	2	#####	220000	52666	272666
IV	2	110000	220000	2	#####	220000	52666	272666
V	2	110000	220000	2	#####	220000	52666	272666

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		8.00								
Comb inatio	Intermediate Stage				Ultimate Stage					Total cost					
	BHP	Units	Cost	Capitalised	BHP	Units	Cost	Capitalised cost	Equ.cost						
I	2	14508	116064	1059558	3	17710	141680	1293409	309632	1369190					
II	2	10913	87304	797006	2	11828	94624	863831	206794	1003800					
III	2	10913	87304	797006	2	11828	94624	863831	206794	1003800					
IV	2	10913	87304	797006	2	11828	94624	863831	206794	1003800					
V	2	10913	87304	797006	2	11828	94624	863831	206794	1003800					

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/ m	Total cost
I	100 DI K9	30	1289	38670
		TOTAL		38670
II	150 DI K9	30	1870	56100
		TOTAL		56100
III	200 DI K9	30	2507	75210
		TOTAL		75210
IV	250 DI K9	30	3367	101010
		TOTAL		101010
V	300 DI K9	30	4251	127530
		TOTAL		127530

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	38670	278863	317533
II	56100	272666	328766
III	75210	272666	347876
IV	101010	272666	373676
V	127530	272666	400196

TABLE 8. Cost of installation and maintenance			
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance
1	2	3	4. (2 + 3)
I	317533	1369190	1686723
II	328766	1003800	1332566
III	347876	1003800	1351676
IV	373676	1003800	1377476
V	400196	1003800	1403996

Pipe Size and Type	Inter.	Ult.
	Pump set Cap.	Pump set Cap.
5.	6.	7.
100 DI K9	3	3
150 DI K9	2	2
200 DI K9	2	2
250 DI K9	2	2
300 DI K9	2	2

Hence Combination	II
consisting of	150 DI K9 30 m x 2 HP
is found to be economical	
Propose	150 DI K9 x 2 HP Non clog pumpset

ELAMKULAM SYSTEM		
From JTA RD M65 to JTA RD M64		
Design of Discharge Chamber		
Diameter	150 DI K9	mm
Peak flow from 150 DI K9m dia Force main	16.04	lps
Size of Discharge Chamber -		
Width of chamber =	1.50	m
Length of chamber =	1.80	m
Assuming width of channel =	1.50	m
Assuming effective length of travel inside the channel =	1.80	m
Assuming a detention time of 2 sec,		
Volume required =	0.032	cu.m
Depth of Flow =	0.012	m
Assume Depth of flow as	0.030	m
Mean Hydraulic Radius, $m = \text{Area} / \text{Wetted Perimeter}$		
	$m = A/P = 1.5 \times 0.03 / (1.5 + 2 \times 0.03)$	
	0.029	m
Assuming $n = 0.014$ for concrete channels and using Manning's formula		
$v = (1/n) m^{2/3} i^{1/2}$		
Providing a slope, $i =$	1 in 200	
Velocity, $V =$	0.48	m/s
Cross-sectional Area, $A =$	1.5×0.03	
	0.045	sq.m
Carrying capacity, $Q =$	$A \times V$	
	21.378	lps
	Hence Safe	

Discharge MH GL		m
Discharge MH IL		m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	1.80	1.50	1.50
Provide Discharge chamber of size 1.8 m x 1.5 x 1.5 m			

0.01

Hence Safe

ELAMKULAM SYSTEM									
DESIGN OF PUMPING MAIN FROM From SBC RD M1 to STP of Block 05									
BASIC DATA							Combination	Pipes selected	
GL AT Wet well site	2.09	m					I	250 DI K9	
Top level of receiving chamber	1.98	m					II	300 DI K9	
Residual Head	2.00	m					III	350 DI K9	
TOTAL HGL REQUIRED AT END	3.98	m					IV	400 DI K9	
FOOT VALVE LEVEL	-2.47	m					V	450 DI K9	
Static head including Residual Head	6.45	m							
Number of reaches	1								
Length	200	m							

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Vclcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	2.09											16.92	14.83	
0	200	1.98	200	250	DI-K9	100	9340	3.171	17	11.76	1.18	12.94	3.98	2.00	
									TOTAL	11.76	1.18	12.94			
Combination II															
	0	2.091											9.22	7.13	
0	200	1.98	200	300	DI-K9	100	9340	2.202	42	4.76	0.48	5.24	3.98	2.00	
									TOTAL	4.76	0.48	5.24			
Combination III															
	0	2.091											6.46	4.36	
0	200	1.98	200	350	DI-K9	100	9340	1.618	89	2.25	0.23	2.48	3.98	2.00	
									TOTAL	2.25	0.23	2.48			
Combination IV															
	0	2.091											5.27	3.18	
0	200	1.98	200	400	DI-K9	100	9340	1.239	171	1.17	0.12	1.29	3.98	2.00	
									TOTAL	1.17	0.12	1.29			
Combination V															
	0	2.091											4.71	2.62	
0	200	1.98	200	450	DI-K9	100	9340	0.979	304	0.66	0.07	0.73	3.98	2.00	
									TOTAL	0.66	0.07	0.73			

ULTIMATE STAGE																
TABLE1. FRICTION LOSS																
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS	
Start	End			Size in mm	Type & Class	C' value										
Combination I																
	0	2.091											18.64	16.55	0	
0	200	1.98	200	250	DI-K9	100	10138	3.442	15	13.33	1.33	14.66	3.98	2.00	0	
									TOTAL	13.33	1.33	14.66				
Combination II																
	0	2.091											10.10	8.01	0	
0	200	1.98	200	300	DI-K9	100	10138	2.39	36	5.56	0.56	6.12	3.98	2.00	0	
									TOTAL	5.56	0.56	6.12				
Combination III																
	0	2.091											6.84	4.75	0	
0	200	1.98	200	350	DI-K9	100	10138	1.756	77	2.6	0.26	2.86	3.98	2.00	0	
									TOTAL	2.6	0.26	2.86				
Combination IV																
	0	2.091											5.48	3.39	0	
0	200	1.98	200	400	DI-K9	100	10138	1.345	147	1.36	0.14	1.50	3.98	2.00	0	
									TOTAL	1.36	0.14	1.50				
Combination V																
	0	2.091											4.83	2.74	0	
0	200	1.98	200	450	DI-K9	100	10138	1.062	261	0.77	0.08	0.85	3.98	2.00	0	
									TOTAL	0.77	0.08	0.85				

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	6.45	11.76	1.176	20.00	13.3	1.333	22.00
II	6.45	4.76	0.476	12.00	5.56	0.556	13.00
III	6.45	2.25	0.225	9.00	2.6	0.26	10.00
IV	6.45	1.17	0.117	8.00	1.36	0.136	8.00
V	6.45	0.66	0.066	8.00	0.77	0.077	8.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	9340	20	58.48	60.0	10138	22	69.82	70.0
II	9340	12	35.09	40.0	10138	13	41.26	45.0
III	9340	9	26.31	30.0	10138	10	31.74	35.0
IV	9340	8	23.39	25.0	10138	8	25.39	30.0
V	9340	8	23.39	25.0	10138	8	25.39	30.0

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	60	46000	2760000	70	46000	3220000	770842	3530842
II	40	47000	1880000	45	47000	2115000	506314	2386314
III	30	50000	1500000	35	50000	1750000	418936	1918936
IV	25	50000	1250000	30	50000	1500000	359088	1609088
V	25	50000	1250000	30	50000	1500000	359088	1609088

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		8.00							
Combination	Intermediate Stage				Ultimate Stage					Total cost				
	BHP	Units	Cost	Capitalised	BHP	Units	Cost	Capitalised cost	Equ.cost					
I	58	382164	3057312	27910462	70	456271	3650168	33322695	7977188	35887650				
II	35	229312	1834496	16747270	41	269632	2157056	19691948	4714096	21461366				
III	26	171935	1375480	12556874	32	207420	1659360	15148439	3626416	16183290				
IV	23	152853	1222824	11163265	25	165923	1327384	12117802	2900905	14064170				
V	23	152853	1222824	11163265	25	165923	1327384	12117802	2900905	14064170				

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/ m	Total cost
I	250 DI K9	200	3367	673400
		TOTAL		673400
II	300 DI K9	200	4251	850200
		TOTAL		850200
III	350 DI K9	200	5188	1037600
		TOTAL		1037600
IV	400 DI K9	200	6226	1245200
		TOTAL		1245200
V	450 DI K9	200	7485	1497000
		TOTAL		1497000

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	673400	3530842	4204242
II	850200	2386314	3236514
III	1037600	1918936	2956536
IV	1245200	1609088	2854288
V	1497000	1609088	3106088

TABLE 8. Cost of installation and maintenance			
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance
1	2	3	4. (2 + 3)
I	4204242	35887650	40091892
II	3236514	21461366	24697880
III	2956536	16183290	19139826
IV	2854288	14064170	16918458
V	3106088	14064170	17170258

Pipe Size and Type	Inter.	Ult.
	Pump set Cap.	Pump set Cap.
5.	6.	7.
250 DI K9	60	70
300 DI K9	40	45
350 DI K9	30	35
400 DI K9	25	30
450 DI K9	25	30

Hence Combination IV consisting of 400 DI K9 200 m x 25 HP is found to be economical
Propose 400 DI K9 x 25 HP Non clog pumpset

ELAMKULAM SYSTEM		
From JTA RD M65 to JTA RD M64		
Design of Discharge Chamber		
Diameter	400 DI K9	mm
Peak flow from 400 DI K9m dia Force main	168.97	lps
Size of Discharge Chamber -		
Width of chamber =	1.50	m
Length of chamber =	1.80	m
Assuming width of channel =	1.50	m
Assuming effective length of travel inside the channel =	1.80	m
Assuming a detention time of 2 sec,		
Volume required =	0.338	cu.m
Depth of Flow =	0.125	m
Assume Depth of flow as	0.130	m
Mean Hydraulic Radius, $m = \text{Area} / \text{Wetted Perimeter}$		
	$m = A/P = 1.5 \times 0.13 / (1.5 + 2 \times 0.13)$	
	0.111	m
Assuming $n = 0.014$ for concrete channels and using Manning's formula		
$v = (1/n) m^{2/3} i^{1/2}$		
Providing a slope, $i =$	1 in 200	
Velocity, $V =$	1.17	m/s
Cross-sectional Area, $A =$	1.5×0.13	
	0.195	sq.m
Carrying capacity, $Q =$	$A \times V$	
	227.199	lps
	Hence Safe	

Discharge MH GL		m
Discharge MH IL		m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	1.80	1.50	1.50
Provide Discharge chamber of size 1.8 m x 1.5 x 1.5 m			

0

Hence Safe

ELAMKULAM SYSTEM									
DESIGN OF PUMPING MAIN FROM From AT RD MI9A to EX.KWA WELL of Block 07									
BASIC DATA						Combination	Pipes selected		
GL AT Wet well site	1.40	m				I	100 DI K9		
Top level of receiving chamber	1.75	m				II	150 DI K9		
Residual Head	2.00	m				III	200 DI K9		
TOTAL HGL REQUIRED AT END	3.75	m				IV	250 DI K9		
FOOT VALVE LEVEL	-2.61	m				V	300 DI K9		
Static head including Residual Head	6.36	m							
Number of reaches	1								
Length	180	m							

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type &	C' value									
Combination I															
	0	1.40											10.82	9.42	
0	180	1.75	180	100	DI-K9	100	649	1.378	28	6.43	0.64	7.07	3.75	2.00	
									TOTAL	6.43	0.64	7.07			
Combination II															
	0	1.4											4.74	3.34	
0	180	1.75	180	150	DI-K9	100	649	0.612	201	0.9	0.09	0.99	3.75	2.00	
									TOTAL	0.9	0.09	0.99			
Combination III															
	0	1.4											3.99	2.59	
0	180	1.75	180	200	DI-K9	100	649	0.344	816	0.22	0.02	0.24	3.75	2.00	
									TOTAL	0.22	0.02	0.24			
Combination IV															
	0	1.4											3.83	2.43	
0	180	1.75	180	250	DI-K9	100	649	0.22	2420	0.07	0.01	0.08	3.75	2.00	
									TOTAL	0.07	0.01	0.08			
Combination V															
	0	1.4											3.78	2.38	
0	180	1.75	180	300	DI-K9	100	649	0.153	5881	0.03	0.00	0.03	3.75	2.00	
									TOTAL	0.03	0.00	0.03			

ULTIMATE STAGE																
TABLE1. FRICTION LOSS																
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS	
Start	End			Size in mm	Type & Class	C' value										
Combination I																
	0	1.4											12.00	10.60	0	
0	180	1.75	180	100	DI-K9	100	705	1.496	24	7.5	0.75	8.25	3.75	2.00	0	
									TOTAL	7.5	0.75	8.25				
Combination II																
	0	1.4											4.89	3.49	0	
0	180	1.75	180	150	DI-K9	100	705	0.665	173	1.04	0.10	1.14	3.75	2.00	0	
									TOTAL	1.04	0.10	1.14				
Combination III																
	0	1.4											4.04	2.64	0	
0	180	1.75	180	200	DI-K9	100	705	0.374	701	0.26	0.03	0.29	3.75	2.00	0	
									TOTAL	0.26	0.03	0.29				
Combination IV																
	0	1.4											3.85	2.45	0	
0	180	1.75	180	250	DI-K9	100	705	0.239	2078	0.09	0.01	0.10	3.75	2.00	0	
									TOTAL	0.09	0.01	0.10				
Combination V																
	0	1.4											3.79	2.39	0	
0	180	1.75	180	300	DI-K9	100	705	0.166	5051	0.04	0.00	0.04	3.75	2.00	0	
									TOTAL	0.04	0.00	0.04				

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	6.36	6.43	0.643	14.00	7.5	0.75	15.00
II	6.36	0.9	0.09	8.00	1.04	0.104	8.00
III	6.36	0.22	0.022	7.00	0.26	0.026	7.00
IV	6.36	0.07	0.007	7.00	0.09	0.009	7.00
V	6.36	0.03	0.003	7.00	0.04	0.004	7.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	649	14	2.85	3.0	705	15	3.31	5.0
II	649	8	1.63	2.0	705	8	1.77	2.0
III	649	7	1.42	2.0	705	7	1.54	2.0
IV	649	7	1.42	2.0	705	7	1.54	2.0
V	649	7	1.42	2.0	705	7	1.54	2.0

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	3	75000	225000	5	75000	375000	89772	314772
II	2	110000	220000	2	#####	220000	52666	272666
III	2	110000	220000	2	#####	220000	52666	272666
IV	2	110000	220000	2	#####	220000	52666	272666
V	2	110000	220000	2	#####	220000	52666	272666

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		8.00							
Combination	Intermediate Stage				Ultimate Stage					Total cost				
	BHP	Units	Cost	Capitalised	BHP	Units	Cost	Capitalised cost	Equ.cost					
I	3	18625	149000	1360234	3	21631	173048	1579770	378184	1738418				
II	2	10652	85216	777944	2	11567	92536	844769	202231	980175				
III	1	9280	74240	677743	2	10064	80512	735001	175953	853697				
IV	1	9280	74240	677743	2	10064	80512	735001	175953	853697				
V	1	9280	74240	677743	2	10064	80512	735001	175953	853697				

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/ m	Total cost
I	100 DI K9	180	1289	232020
		TOTAL		232020
II	150 DI K9	180	1870	336600
		TOTAL		336600
III	200 DI K9	180	2507	451260
		TOTAL		451260
IV	250 DI K9	180	3367	606060
		TOTAL		606060
V	300 DI K9	180	4251	765180
		TOTAL		765180

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	232020	314772	546792
II	336600	272666	609266
III	451260	272666	723926
IV	606060	272666	878726
V	765180	272666	1037846

TABLE 8. Cost of installation and maintenance			
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance
1	2	3	4. (2 + 3)
I	546792	1738418	2285210
II	609266	980175	1589441
III	723926	853697	1577623
IV	878726	853697	1732423
V	1037846	853697	1891543

Pipe Size and Type	Inter.	Ult.
	Pump set Cap.	Pump set Cap.
5.	6.	7.
100 DI K9	3	5
150 DI K9	2	2
200 DI K9	2	2
250 DI K9	2	2
300 DI K9	2	2

Hence Combination III consisting of 200 DI K9 180 m x 2 HP is found to be economical

Propose 200 DI K9 x 2 HP Non clog pumpset

ELAMKULAM SYSTEM		
From JTA RD M65 to JTA RD M64		
Design of Discharge Chamber		
Diameter	200 DI K9	mm
Peak flow from 200 DI K9m dia Force main	11.75	lps
Size of Discharge Chamber -		
Width of chamber =	1.50	m
Length of chamber =	1.80	m
Assuming width of channel =	1.50	m
Assuming effective length of travel inside the channel =	1.80	m
Assuming a detention time of 2 sec,		
Volume required =	0.023	cu.m
Depth of Flow =	0.009	m
Assume Depth of flow as	0.030	m
Mean Hydraulic Radius, $m = \text{Area} / \text{Wetted Perimeter}$		
	$m = A/P = 1.5 \times 0.03 / (1.5 + 2 \times 0.03)$	
	0.029	m
Assuming $n = 0.014$ for concrete channels and using Manning's formula		
$v = (1/n) m^{2/3} i^{1/2}$		
Providing a slope, $i =$	1 in 200	
Velocity, $V =$	0.48	m/s
Cross-sectional Area, $A =$	1.5×0.03	
	0.045	sq.m
Carrying capacity, $Q =$	$A \times V$	
	21.378	lps
	Hence Safe	

Discharge MH GL		m
Discharge MH IL		m

Required depth of Chamber	1.5	1.5
Required depth of Manhole	1.5	1.6

	L(m)	B(m)	D(m)
Size of chamber	1.80	1.50	1.50
Provide Discharge chamber of size 1.8 m x 1.5 x 1.5 m			

0.02

Hence Safe

NAME OF SCHEME: < DESIGN -MUTTAR SYSTEM
CONSTRUCTION OF LIFT MAN HOLES

INPUT			1	2	3	4	5	6	7	8
			Block 05	Block 06	Block 08	Block 08	Block 12A	Block 12A	Block 05	Block 07
LIFT MH NAME			JTA RD M65	CHR RD M27L	MPK LN RD M3L	PNL RD M12	VBW L M9L	AH LN RD M 18.4	SBC RD M1	AT RD MI9A
Size of MH			4.36 m (Depth) x 2.5m(Dia)	6.01 m (Depth) x 2.5m(Dia)	5 m (Depth) x 3.5m(Dia)	6.13 m (Depth) x 2.5m(Dia)	6.25 m (Depth) x 3m(Dia)	4.99 m (Depth) x 2.5m(Dia)	6.06 m (Depth) x 5.5m(Dia)	5.51 m (Depth) x 2.5m(Dia)
Lift Man hole Depth		m	4.36	6.01	5.00	6.13	6.25	4.99	6.06	5.51
Dia		m	2.50	2.50	3.50	2.50	3.00	2.50	5.50	2.50
Cover slab Thk.		m	0.25	0.25	0.25	0.25	0.25	0.25	0.3	0.25
Side wall Thk.		m	0.25	0.3	0.25	0.3	0.3	0.25	0.3	0.3
Base slab thk		m	0.3	0.3	0.3	0.3	0.3	0.3	0.45	0.3
Base slab Projection		m	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Addl. Working Width		m	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Sand Filling		m	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
PCC for LC		m	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Pipe dia		mm	200	200	200	200	200	200	200	200
MH cover	Dia.	m	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Side wall perimeter-centre of section		m	8.64	8.8	11.78	8.8	10.37	8.64	18.22	8.8
Base slab Dia		m	3.4	3.5	4.4	3.5	4	3.4	6.5	3.5
Projection above GL		m	0.25	0.25	0.25	0.25	0.25	0.25	0.3	0.25
Depth		m	4.96	6.61	5.6	6.73	6.85	5.59	6.81	6.11
Dia		m	4	4.1	5	4.1	4.6	4	7.1	4.1
EW	Volume	cum	62.329	87.269	109.956	88.853	113.84	70.246	269.621	80.668
SAND FILLING	Volume	cum	1.885	1.98	2.945	1.98	2.493	1.885	5.939	1.98
PCC for LC	Volume	cum	1.885	1.98	2.945	1.98	2.493	1.885	5.939	1.98
COVER SLAB	Dia.	m	3	3.1	4	3.1	3.6	3	6.1	3.1
COVER SLAB	Volume	cum	1.77	1.89	3.14	1.89	2.54	1.77	8.77	1.89
Deduct for MH cover		cum	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.07
Net volume		cum	1.7	1.82	3.07	1.82	2.47	1.7	8.69	1.82
Side wall	Clear Ht.	m	4.11	5.76	4.75	5.88	6	4.74	5.76	5.26
	volume	cum	8.88	15.2	13.99	15.52	18.66	10.24	31.49	13.88
Base slab	volume	cum	2.72	2.89	4.56	2.89	3.77	2.72	14.93	2.89
Cover Slab	Bottom	sqm	4.91	4.91	9.62	4.91	7.07	4.91	23.76	4.91
	Deduct for MH cover (Dia. 0.6 m)	sqm	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28	-0.28
	Net	sqm	4.63	4.63	9.34	4.63	6.79	4.63	23.48	4.63
Cover slab	Sides	sqm	2.36	2.43	3.14	2.43	2.83	2.36	5.75	2.43
Side wall	Inner & Outer	sqm	71.02	101.34	111.92	103.45	124.41	81.9	209.91	92.54
Base slab	Sides		3.2	3.3	4.15	3.3	3.77	3.2	9.19	3.3
Refilling	Base slab portion	cum	1.05	1.07	1.33	1.07	1.22	1.05	2.88	1.07
	Side wall portion	cum	22.6	32.57	33.58	33.25	38.64	26.06	59.72	29.74
BENCHING	Chord length	cum	1.25	1.25	1.75	1.25	1.5	1.25	2.75	1.25
	Area of segment	sqm	4.909	4.909	9.621	4.909	7.069	4.909	23.758	4.909
	Depth of Benching	m	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Volume	cum	0.98	0.98	1.92	0.98	1.41	0.98	4.75	0.98

DESIGN OF SEWAGE WET WELLS, PUMPING MAIN & PUMP SETS
ELAMKULAM STP-From WW1 of Block 12A to WW2 of Block 12B

Note:

(ref: CPHEEO Manual-4.20-Sewage pumping main are designed water pumping mains. The exception being that the design practice of economical size of pumping mains in conjunction with the electrical energy of the pump sets as used in water pumping mains is not applicable in sewage pumping mains. This is due to varying rates of discharge through the 24 hours like low, average and peak flows through the same main at various parts of the day and night.

During execution the total head for pumpsets should be calculated considering the wastage due to valves and specials actually used.

In the design 10% of the friction loss is included as minor loss to take care of this.

Basic Data

Block No.	TM ends at	IL at the end of TM as per SNW Design	Ult.Peak Flow as per SNW Design. (lps)	Pumping main					
				From	To	Length m	Flow ult.peak flow (3 DWF)	GL	
								From	To
12A	WW1	-0.83	80.15	WW1	WW2	2030	80.15	2.44	1.59
12B	WW2	-2.16	78.311	WW2	IC@STP	3500	158.461	1.59	1.98

Pumping main from WW1 to WW2

Ultimate peak flow **80.15 lps** **4809 lpm**

Flow in MLD

Stage	Year	Flow in MLD
Initial	2025	5.81
Intermediate	2040	6.37
Ultimate	2055	6.92

Length of Pumping Main	2030.00	m
Top level of Wet Well 1	2.59	m
Hours of pumping	24.00	hrs
Residual Head	2.00	m
FOOT VALVE LEVEL	-3.44	m
Static head including Residual Head	8.03	m

RESULTS

SEWAGE QUANTITY

Discharge (3 DWF)

Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		Pipe size and type	Pumpset Capacity (HP) (Intermediate)	Pipe size and type	Pumpset Capacity (HP) (Base year to Intermediate)	Pumpset Capacity (HP) (Inter. To Ultimate)	Inter.	Ult
Initial	2025	5.81	4035	67.25	ECP-3-DWF	350 DI K9	20.00	300 DI K9	25.00	25.00	1.04	1.13
Intermediate	2040	6.37	4424	73.73								
Ultimate	2055	6.92	4806	80.09								

Discharge (2 DWF)

Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		Pipe size and type	Pumpset Capacity (HP) (Intermediate)	Pipe size and type	Pumpset Capacity (HP) (Base year to Intermediate)	Pumpset Capacity (HP) (Inter. To Ultimate)	Inter.	Ult
Initial	2025	3.88	2694	44.91	ECP-2-DWF	300 DI K9	15.00	300 DI K9	15.00	15.00	0.69	0.76
Intermediate	2040	4.24	2944	49.07								
Ultimate	2055	4.62	3208	53.47								

Discharge (1 DWF)

Discharge (2-DWF)												
Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		Pipe size and type	Pumpset Capacity (HP) (Intermediate)	Pipe size and type	Pumpset Capacity (HP) (Base)	Pumpset Capacity (HP) (Inter.)	Inter.	Ult
							Available		Available	Available		
Initial	2025	1.94	1347	22.45	ECP-1-DWF	250 DI K9	5.00	300 DI K9	5.00	5.00	0.35	0.38
Intermediate	2040	2.12	1472	24.54								
Ultimate	2055	2.31	1604	26.74								

PROVIDE PUMPING MAIN OF **300 DI K9** SIZE

RESULTS

Size of main **300 DI K9**

PUMPSETS

During the period from 2025 to 2040 (considering 15 years as life of pumpset)

Provide	15 HP x	1 NO.
Provide	10 HP x	1 NO.
Standby	10 HP x	1 NO.

PUMP SET OPERATING PLAN (Tentative)

Lean period (1 DWF)	10 HP x	1 NO.
Ave, flow (2 DWF)	15 HP x	1 NO.
+	0 HP x	1 NO.
Peak, flow (3 DWF)	15 HP x	1 NO.
+	10 HP x	1 NO.

During the period from 2040 to 2055 (considering 15 years as life of pumpset)

Provide	15 HP x	2 NO.
Standby	10 HP x	1 NO.

PUMP SET OPERATING PLAN (Tentative)

Lean period (1 DWF)	10 HP x	1 NO.
Ave, flow (2 DWF)	15 HP x	1 NO.
+	0 HP x	1 NO.
Peak, flow (3 DWF)	15 HP x	2 NO.

For Estimate of pump sets propose (Intermediate)

15 HP x 1 No. + 10 HP x 1 No. + 10 HP x 1 No. Standby

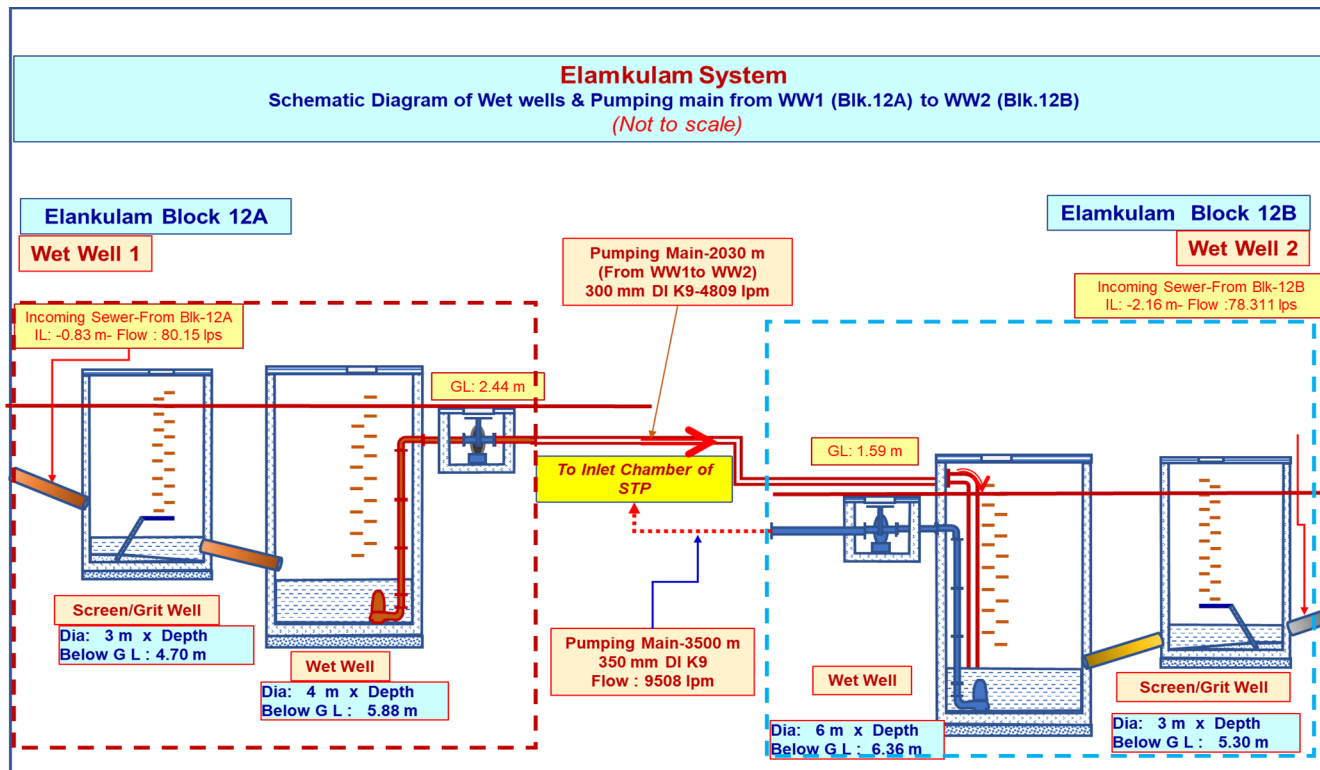
CHECK

15	25
10	

10	5.00
15	15.00
0	
15	25.00
10	

30	25
10	

10	5.00
15	15.00
0	
30	25.00



ELAMKULAM STP-From WW1 of Block 12A to WW2 of Block 12B			
Design/Input Data			
Sr. No.	Description	Values	Unit
Input values			
1	Average Flow	5.81	MLD
2	Intermediate Flow	6.37	MLD
3	Peak Flow	6.92	MLD
4	GL at WW1 site	2.44	m
5	IL of Incoming Sewer	-0.83	m
6	Length of Rising Main	2030	m
	GL at WW2 site	1.59	
7	Wet well 2-Top level	2.59	m
8	Dia of incoming sewer	0.50	m
9	d/D of incoming sewer	0.66	
10	Velocity in sewer at peak design Ultimate flow	0.78	m/s
11	Residual Head	2.00	m
Output values			
1	Average Flow	242.08	m ³ /hr
2	Peak Flow	288.33	m ³ /hr
3	Suction Depth (Depth of WW1)	5.88	m

ELAMKULAM STP-From WW1 of Block 12A to WW2 of Block 12B			
Diameter required for Screen/Grit well			
Data			
Average Flow	5.810	MLD	
Peak Design Flow	6.920	MLD	
	0.080	m ³ /s	0.080
Inner Dia of incoming sewer	0.500	m	OD: 0.25
d/D	0.660		
Depth of flow in sewer at peak flow	0.330	m	0.2
Velocity in sewer at peak design Ultimate flow	0.780	m/s	
Drop of screen chamber floor to invert	0.080	m	
G.L of Screen well	2.440	m	
I.L of Screen Well	-0.830	m	
Assumed width of bars	10	mm	
Clear spacing between bars	25	mm	
Design of Bar Rack (Screen)			
Type of Screening		Manual	
Assume Velocity through screen	0.7	m/s	0.7
Clear area of openings through the rack	0.114	m ²	0.114
Clear width of openings through the rack	0.347	m	0.572
Number of clear spacings	14.000		
So number of bars	13.000		
Total width of the Screen	0.500	m	
Projected fixtures width each side	0.150	m	
Total width of the Screen	0.800	m	
Angle of Inclination of Bar	45 °		
→Angle of Inclination should be 75 °-85° in Mechanically Cleaned and 45° in Manually			
Height above G.L	1.000	m	
Total depth of Bar Rack	1.300	m	
Sin 45°	0.707		
Slant height of Screen	1.900	m	
Tan 45°	1.000		
Horizontal length of Screen	1.300		
Length between pipe and screen	0.600	m	
Length between screen and Effluent pipe(To accommodate grit pump & operating platform)	1.500	m	
Total Length of the chamber	3.000	m	
Providing Manual Screen of Size 0.8 m Width X 1.9 m Height			
Providing well internal diameter of Screen/Grit Well 3 m			

Design of Grit Well

Peak Flow	=	4806.000	lpm
Average Flow	=	4035.000	lpm
Ground Level	=	2.440	m
Invert Level of Incoming	=	-0.830	m
Size of Approach Sewer	=	500.000	mm

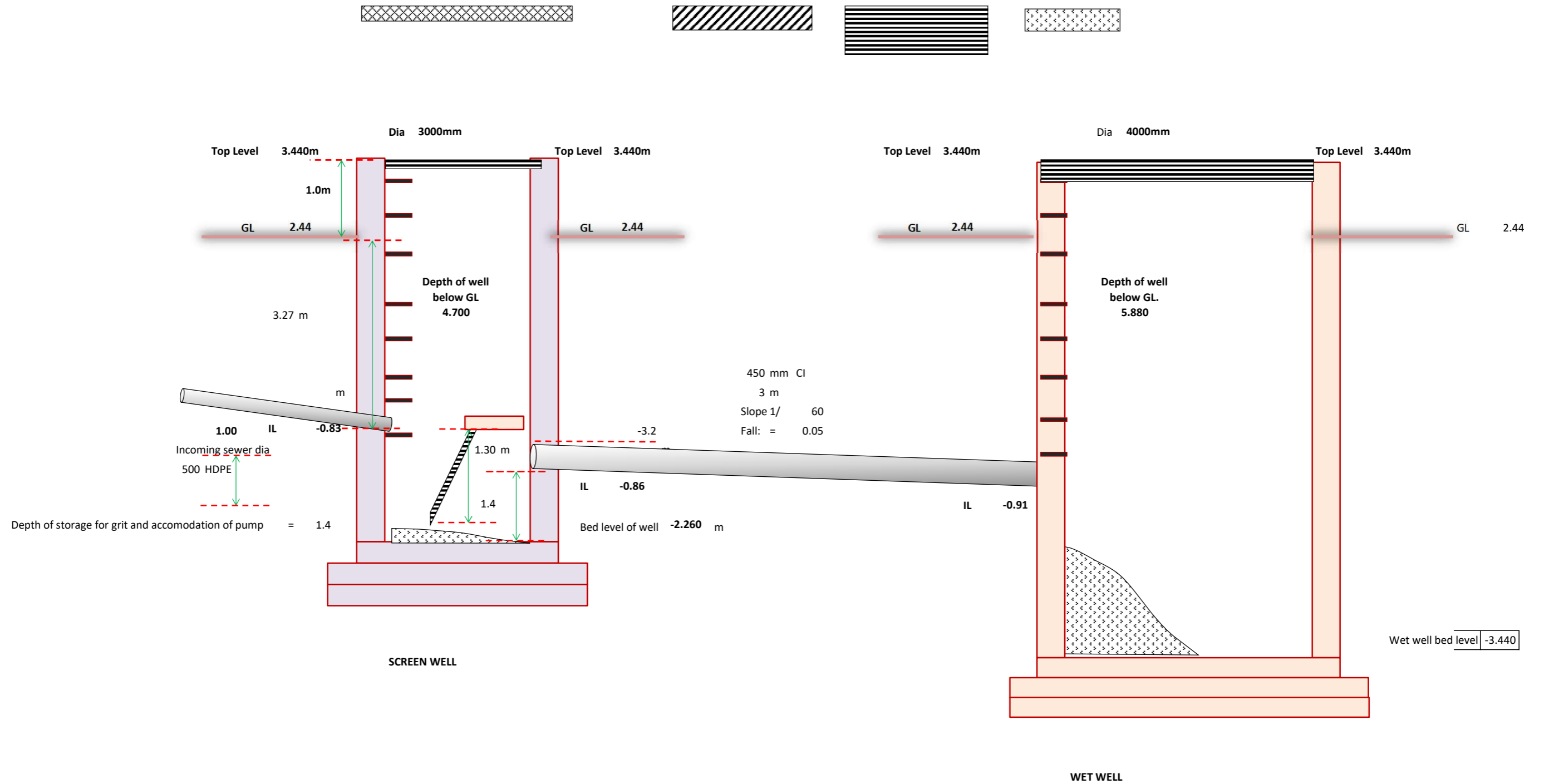
Volume of grit collection

As per CPHEEO Manual, volume of grit generated is 0.05 to 0.15 cu.m / ML

hence, take maximum, $0.15 = 0.15 \times 1000 \text{ m}^3 / \text{Mm}^3$
 $= 150 \text{ m}^3 / \text{Mm}^3$

Diameter required for Screen/Grit well	
This quantity is for 24 hrs, hence, per hour flow	= 150 / 24
	= 6.25 m ³ / mm ³
The quantity increases 3 to 4 times during peak	
Taking average, 3.5	= 3.5 x 6.25
	= 21.875 m ³ / mm ³
This quantity lasts for 2 to 3 hours in Morning and evening	
Hence, taking the maximum hours of	= 3
Volume = 3 x 21.88	= 65.625 m ³ / mm ³
For 5 hours of normal flow =	= 6.250 x 5
	= 31.250 m ³ / mm ³
Therefore for total / day	= 96.875 m ³ / mm ³
Volume of grit collected / day	= 4806 x 60 x 24 96.88
	1000 10 ⁶
	= 0.670 cu.m
Volume of Storage required	= 0.670 cu.m
Assuming dia of well as	= 3.00 m
Area of well	= 7.069 sq.m
Depth of Storage required	= 0.095 m
Total depth of Bar Rack	= 1.300
Total depth requird.	= 1.395
Provide a minimum depth of	= 1.40 Min. 1.20 to accomo
Check:	
Volume provided	= 12 x 3 x 3 x 1.4 x 2
	= 7 x 4
	= 6.600 cu.m
No. of days	= 6.600 / 0.67
	= 9.844 days
Depth of Grit well	
G.L	= 2.440 m
I.L of incoming pipe	= -0.830 m
Depth of storage for grit and accomodation of pump	= 1.400 m
Total depth	= 4.670 m
Provide a Total depth below GL.	= 4.700 m

ELAMKULAM STP-From WW1 of Block 12A to WW2 of Block 12B				
Design/Input Data				
Wet Well Calculations				
Sr. No.	Description	Unit	Value	Remark
Basic details				
1	Peak Flow	m ³ /hr	288.333	
wet well design				
1	Time for one pump cycle for ultimate design stage	min	15.00	CPHEEP manual part A; 4.6.6
2	wet well capacity required for ultimate design stage	m ³	18.021	
3	Assumed sewage depth in wet well	m	1.500	
4	Area required for wet well	m ²	12.014	
5	Diameter required for wet well	m	3.911	
6	Diameter provided for wet well	m	4.000	
7	Actual provided wet well area	m ²	12.566	
8	Actual provided wet well capacity	m ³	18.850	
9	Ground level at wet well site	m	2.440	
10	Invert level of incoming sewer in wet well	m	-0.940	
11	Difference between MWL in wet well and incoming	m	0.100	
12	Maximum water level in wet well (MWL)	m	-1.040	
13	Lowest water level in wet well (LWL)	m	-2.540	
14	Required pump submergence depth	m	0.900	
15	Wet well bed level	m	-3.440	
wet well dimensions				
1	Total wet well depth	m	5.880	
2	Wet well diameter required	m	4.000	
3	Wet well diameter to be provided	m	4.000	



Valve Chamber		
Length	1.90	m
Breadth	3.60	m
Total Depth	1.70	m
penstock depth-Grit /screen	3.50	m
penstock depth-Suction well	3.50	m
Silt Pit		
Length	1.5	m
Width	1.5	m
Depth	1.2	m

Valve Chamber*			
Dia, mm	L, m	B, m	D, m
100	1.4	3.3	1.4
150	1.5	3.4	1.5
200	1.6	3.5	1.5
250	1.8	3.5	1.6
300	1.9	3.6	1.7
350	2.1	3.7	1.8
400	2.3	3.8	1.9
450	2.4	3.9	2.1
500	2.4	3.9	2.2
600	2.8	4.7	2.4
700	2.9	4.8	2.7
750	2.9	4.8	2.8
800	3	4.9	3
900	3.1	5	3.2
1000	3.2	5.1	3.4

SPS DATA		
Depth of Suction Well	5.88	m
Dia of Suction Well	4.00	m
Pump HP	15.00	HP
RM Delivery Pipe Dia.	300.00	mm
SCREEN WELL DATA		
G.L	2.44	m
I.L of incoming pipe	-0.83	m
Dia of Grit Well	3.00	m
Incoming Pipe Dia. Of Network	500.00	mm
Total width of the Screen	1.30	m
Slant height of Screen	1.90	m
Depth	4.70	m

SOURCE :

wt.of 25x3 mm flat=0.59 kg/m	0.59
wt.of 12x3 mm flat=0.28 kg/m	0.28
wt.of 25x6 mm flat=1.18 kg/m	1.18
wt.of 50x10 mm flat=3.92 kg/m	3.92
wt.of 50x50 x6mm angle=4.47 kg/m	4.47
wt.of 150x75 x10mm angle=16.9 kg/m	16.9
wt.of ISMB 300mm =42.2 kg/m	42.2
wt.of ISMB 400mm =66.3 kg/m	66.3
wt.of ISMB 600mm =122 kg/m	122

Pipe Depth at IntCon.	3.50	m
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Grit Well					
Design of Grit Well					
Depth of Grit Well	4.70	m		Total Depth(m)	5.75
Parapet Height	1.00	m		outer dia (m)	3.9
Total Height of well + Parapet	5.70	m		centre dia(m)	3.45
Dia of Grit Well	3	m		raft dia(m)	3.00
Thickness of wall	0.45	m		Screen Horizontal platform width(m)	1.5
Thickness of Raft Slab	0.45	m		Screen Mesh Opening(m)	0.6
Thickness of Plugging	0.30	m			

Design of kerb					
Diameter of grit well	3.00	m		Extra width for Excavation for working including both sides	1.2
Well wall thickness	0.45	m		Benching depth assumed	0.25
Kerb wall thickness at top	0.53	m			
Kerb wall thickness at bottom	0.15	m			
kerb height outer	1.05	m			
kerb height inner	0.45	m			
kerb height outer excluding inner	0.60	m			
kerb slope	0.71	m			
Thickness of raft	0.45	m			
Thickness of plugging	0.30	m			
Circumference of well kerb (l)	11.07	m			
Volume of Kerb	4.86	cu.m			

Suction Well					
Design Data					
Depth of Suction Well	5.88	m		Screen Mesh Opening for Pump	
Parapet Height	1.00	m		Length(m)	1
Total Height of well + Parapet	6.88	m		Breadth(m)	1.5
Dia of Suction Well	4.00	m		Outer Dia (m)	5
Thickness of wall	0.5	m		Center Dia (m)	4.50
Thickness of Raft Slab	0.5	m		Raft Dia (m)	4.00
Thickness of Plugging	0.3	m		Total Depth	6.93
Design of kerb					
Diameter of wall	4.00	m			
Well wall thickness	0.50	m			
Kerb wall thickness at top	0.58	m			
Kerb wall thickness at bottom	0.15	m			
kerb height outer	1.05	m			
kerb height inner	0.50	m			
kerb height outer excluding inner	0.55	m			
kerb slope	0.70	m			
Thickness of raft	0.50	m			
Thickness of plugging	0.30	m			
Circumference of well kerb (l)	14.37	m			
Volume of Kerb	2.05	cu.m			

DESIGN OF PUMPING MAIN

BASIC DATA		
GL AT Wet well site	2.440	m
Top level of receiving chamber	2.590	m
Residual Head	2.000	m
TOTAL HGL REQUIRED AT END	2.590	m
FOOT VALVE LEVEL	-3.440	m
Static head including Residual Head	8.030	m
Number of reaches	1	
Length	2030	m

Combination	Pipes selected
I	200 DI K9
II	250 DI K9
III	300 DI K9
IV	350 DI K9
V	400 DI K9

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velocity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.44											55.34	52.90	AT WET WELL
0	2030	2.59	2030	200	DI-K9	140	4424	2.347	44	46.14	4.61	50.75	4.59	2.00	AT STP SITE
									TOTAL	46.14	4.61	50.75			
Combination II															
	0	2.44											21.90	19.46	AT WET WELL
0	2030	2.59	2030	250	DI-K9	140	4424	1.502	129	15.74	1.57	17.31	4.59	2.00	AT STP SITE
									TOTAL	15.74	1.57	17.31			
Combination III															
	0	2.44											11.70	9.26	AT WET WELL
0	2030	2.59	2030	300	DI-K9	140	4424	1.043	314	6.46	0.65	7.11	4.59	2.00	AT STP SITE
									TOTAL	6.46	0.65	7.11			

Combination IV															
	0	2.44											7.95	5.51	AT WET WELL
0	2030	2.59	2030	350	DI-K9	140	4424	0.766	665	3.05	0.31	3.36	4.59	2.00	AT STP SITE
									TOTAL	3.05	0.31	3.36			
Combination V															
	0	2.44											6.34	3.90	AT WET WELL
0	2030	2.59	2030	400	DI-K9	140	4424	0.587	1274	1.59	0.16	1.75	4.59	2.00	AT STP SITE
									TOTAL	1.59	0.16	1.75			
ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velocity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.44											64.94	62.50	AT WET WELL
0	2030	2.59	2030	200	DI-K9	140	4806	2.549	37	54.86	5.49	60.35	4.59	2.00	AT STP SITE
									TOTAL	54.86	5.49	60.35			
Combination II															
	0	2.44											24.71	22.27	AT WET WELL
0	2030	2.59	2030	250	DI-K9	140	4806	1.632	111	18.29	1.83	20.12	4.59	2.00	AT STP SITE
									TOTAL	18.29	1.83	20.12			
Combination III															
	0	2.44											12.90	10.46	AT WET WELL
0	2030	2.59	2030	300	DI-K9	140	4806	1.133	269	7.55	0.76	8.31	4.59	2.00	AT STP SITE
									TOTAL	7.55	0.76	8.31			
Combination IV															
	0	2.44											8.51	6.07	AT WET WELL
0	2030	2.59	2030	350	DI-K9	140	4806	0.832	571	3.56	0.36	3.92	4.59	2.00	AT STP SITE
									TOTAL	3.56	0.36	3.92			
Combination V															
	0	2.44											6.64	4.20	AT WET WELL
0	2030	2.59	2030	400	DI-K9	140	4806	0.637	1093	1.86	0.19	2.05	4.59	2.00	AT STP SITE
									TOTAL	1.86	0.19	2.05			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	8.03	46.14	4.614	58.78	54.9	5.486	68.38
II	8.03	15.74	1.574	25.34	18.3	1.829	28.15
III	8.03	6.46	0.646	15.14	7.55	0.755	16.34
IV	8.03	3.05	0.305	11.39	3.56	0.356	11.95
V	8.03	1.59	0.159	9.78	1.86	0.186	10.08

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	4424	59	81	85	4806	68	103	105
II	4424	25	35	40	4806	28	42	45
III	4424	15	21	25	4806	16	25	25
IV	4424	11	16	20	4806	12	18	20
V	4424	10	14	15	4806	10	15	20

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	85	46000	3910000	105	50000	5250000	1256808	5166808
II	40	47000	1880000	45	47000	2115000	506314	2386314
III	25	50000	1250000	25	50000	1250000	299240	1549240
IV	20	50000	1000000	20	50000	1000000	239392	1239392
V	15	58000	870000	20	50000	1000000	239392	1109392

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		10								
Comb inatio	Intermediate Stage				Ultimate Stage						Total cost				
	BHP	Units	Cost	Capitalised	BHP	Units	Cost	Capitalised cost	Equ.cost						
I	81	531946	5319460	48561804	103	672186	6721860	61364433	14690157	63251961					
II	35	229377	2293770	20940022	42	276690	2766900	25259266	6046867	26986889					
III	21	136973	1369730	12504382	25	160564	1605640	14658024	3509015	16013396					
IV	16	103056	1030560	9408070	18	117433	1174330	10720559	2566417	11974487					
V	14	88483	884830	8077689	15	99070	990700	9044185	2165106	10242794					

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	200 DI K9	2030	2507	5089210
		TOTAL		5089210
II	250 DI K9	2030	3367	6835010
		TOTAL		6835010
III	300 DI K9	2030	4251	8629530
		TOTAL		8629530
IV	350 DI K9	2030	5188	10531640
		TOTAL		10531640
V	400 DI K9	2030	6226	12638780
		TOTAL		12638780

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	5089210	5166808	10256018
II	6835010	2386314	9221324
III	8629530	1549240	10178770
IV	10531640	1239392	11771032
V	12638780	1109392	13748172

TABLE 8. Cost of installation and maintenance

Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size	Inter. Pump set	Ult. Pump set Cap.
1	2	3	4. (2 + 3)	5.	6.	7.
I	10256018	63251961	73507979	200 DI K9	85	105
II	9221324	26986889	36208213	250 DI	40	45
III	10178770	16013396	26192166	300 DI K9	25	25
IV	11771032	11974487	23745519	350 DI	20	20
V	13748172	10242794	23990966	400 DI K9	15	20

Hence Combination IV consisting of 350 DI K9 2030 m x 20 HP is found to be economical

DESIGN OF PUMPING MAIN

BASIC DATA		
GL AT Wet well site	2.440	m
Top level of receiving chamber	2.590	m
Residual Head	2.000	m
TOTAL HGL REQUIRED AT END	2.590	m
FOOT VALVE LEVEL	-3.440	m
Static head including Residual Head	8.030	m
Number of reaches	1	
Length	2030	m

Combination	Pipes selected
I	200 DI K9
II	250 DI K9
III	300 DI K9
IV	350 DI K9
V	400 DI K9

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velocity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.44											28.60	26.16	AT WET WELL
0	2030	2.59	2030	200	DI-K9	140	2944	1.562	93	21.83	2.18	24.01	4.59	2.00	AT STP SITE
									TOTAL	21.83	2.18	24.01			
Combination II															
	0	2.44											12.71	10.27	AT WET WELL
0	2030	2.59	2030	250	DI-K9	140	2944	1	275	7.38	0.74	8.12	4.59	2.00	AT STP SITE
									TOTAL	7.38	0.74	8.12			
Combination III															
	0	2.44											7.93	5.49	AT WET WELL
0	2030	2.59	2030	300	DI-K9	140	2944	0.694	667	3.04	0.30	3.34	4.59	2.00	AT STP SITE
									TOTAL	3.04	0.30	3.34			

Combination IV															
	0	2.44											6.17	3.73	AT WET WELL
0	2030	2.59	2030	350	DI-K9	140	2944	0.51	1413	1.44	0.14	1.58	4.59	2.00	AT STP SITE
									TOTAL	1.44	0.14	1.58			
Combination V															
	0	2.44											5.42	2.98	AT WET WELL
0	2030	2.59	2030	400	DI-K9	140	2944	0.391	2708	0.75	0.08	0.83	4.59	2.00	AT STP SITE
									TOTAL	0.75	0.08	0.83			
ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Vclcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.44											32.86	30.42	AT WET WELL
0	2030	2.59	2030	200	DI-K9	140	3208	1.702	79	25.7	2.57	28.27	4.59	2.00	AT STP SITE
									TOTAL	25.7	2.57	28.27			
Combination II															
	0	2.44											14.14	11.70	AT WET WELL
0	2030	2.59	2030	250	DI-K9	140	3208	1.089	234	8.68	0.87	9.55	4.59	2.00	AT STP SITE
									TOTAL	8.68	0.87	9.55			
Combination III															
	0	2.44											8.52	6.08	AT WET WELL
0	2030	2.59	2030	300	DI-K9	140	3208	0.756	569	3.57	0.36	3.93	4.59	2.00	AT STP SITE
									TOTAL	3.57	0.36	3.93			
Combination IV															
	0	2.44											6.44	4.00	AT WET WELL
0	2030	2.59	2030	350	DI-K9	140	3208	0.556	1206	1.68	0.17	1.85	4.59	2.00	AT STP SITE
									TOTAL	1.68	0.17	1.85			
Combination V															
	0	2.44											5.56	3.12	AT WET WELL
0	2030	2.59	2030	400	DI-K9	140	3208	0.426	2310	0.88	0.09	0.97	4.59	2.00	AT STP SITE
									TOTAL	0.88	0.09	0.97			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	8.03	21.83	2.183	32.04	25.7	2.57	36.30
II	8.03	7.38	0.738	16.15	8.68	0.868	17.58
III	8.03	3.04	0.304	11.37	3.57	0.357	11.96
IV	8.03	1.44	0.144	9.61	1.68	0.168	9.88
V	8.03	0.75	0.075	8.86	0.88	0.088	9.00

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	2944	32	30	30	3208	36	36	40
II	2944	16	15	15	3208	18	18	20
III	2944	11	10	15	3208	12	12	15
IV	2944	10	9	10	3208	10	10	10
V	2944	9	8	10	3208	9	9	10

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	30	50000	1500000	40	47000	1880000	450057	1950057
II	15	58000	870000	20	50000	1000000	239392	1109392
III	15	58000	870000	15	58000	870000	208271	1078271
IV	10	63000	630000	10	63000	630000	150817	780817
V	10	63000	630000	10	63000	630000	150817	780817

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		10								
Comb inatio	Intermediate Stage				Ultimate Stage					Total cost					
	BHP	Units	Cost	Capitalised	BHP	Units	Cost	Capitalised cost	Equ.cost						
I	30	192977	1929770	17617035	36	238265	2382650	21751415	5207116	22824151					
II	15	97240	972400	8877123	18	115342	1153420	10529670	2520719	11397842					
III	10	68486	684860	6252145	12	78485	784850	7164963	1715235	7967380					
IV	9	57900	579000	5285740	10	64827	648270	5918112	1416749	6702489					
V	8	53325	533250	4868085	9	59076	590760	5393098	1291065	6159150					

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	200 DI K9	2030	2507	5089210
		TOTAL		5089210
II	250 DI K9	2030	3367	6835010
		TOTAL		6835010
III	300 DI K9	2030	4251	8629530
		TOTAL		8629530
IV	350 DI K9	2030	5188	10531640
		TOTAL		10531640
V	400 DI K9	2030	6226	12638780
		TOTAL		12638780

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	5089210	1950057	7039267
II	6835010	1109392	7944402
III	8629530	1078271	9707801
IV	10531640	780817	11312457
V	12638780	780817	13419597

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	2	3	4. (2 + 3)	5.	6.	7.
I	7039267	22824151	29863418	200 DI K9	30	40
II	7944402	11397842	19342244	250 DI K9	15	20
III	9707801	7967380	17675181	300 DI K9	15	15
IV	11312457	6702489	18014946	350 DI K9	10	10
V	13419597	6159150	19578747	400 DI K9	10	10

Hence Combination III
consisting of 300 DI K9 2030 m x 15 HP
is found to be economical

DESIGN OF PUMPING MAIN

BASIC DATA		
GL AT Wet well site	2.44	m
Top level of receiving chamber	2.59	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	2.59	m
FOOT VALVE LEVEL	-3.44	m
Static head including Residual Head	8.03	m
Number of reaches	1	
Length	2030	m

Combination	Pipes selected
I	200 DI K9
II	250 DI K9
III	300 DI K9
IV	350 DI K9
V	400 DI K9

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.44											11.28	8.84	AT WET WELL
0	2030	2.59	2030	200	DI-K9	140	1472	0.781	334	6.08	0.61	6.69	4.59	2.00	AT STP SITE
									TOTAL	6.08	0.61	6.69			
Combination II															
	0	2.44											6.85	4.41	AT WET WELL
0	2030	2.59	2030	250	DI-K9	140	1472	0.5	991	2.05	0.21	2.26	4.59	2.00	AT STP SITE
									TOTAL	2.05	0.21	2.26			
Combination III															
	0	2.44											5.51	3.07	AT WET WELL
0	2030	2.59	2030	300	DI-K9	140	1472	0.347	2408	0.84	0.08	0.92	4.59	2.00	AT STP SITE
									TOTAL	0.84	0.08	0.92			

Combination IV															
	0	2.44											5.03	2.59	AT WET WELL
0	2030	2.59	2030	350	DI-K9	140	1472	0.255	5102	0.4	0.04	0.44	4.59	2.00	AT STP SITE
									TOTAL	0.4	0.04	0.44			
Combination V															
	0	2.44											4.82	2.38	AT WET WELL
0	2030	2.59	2030	400	DI-K9	140	1472	0.195	9776	0.21	0.02	0.23	4.59	2.00	AT STP SITE
									TOTAL	0.21	0.02	0.23			
ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	2.44											12.42	9.98	AT WET WELL
0	2030	2.59	2030	200	DI-K9	140	1604	0.851	285	7.12	0.71	7.83	4.59	2.00	AT STP SITE
									TOTAL	7.12	0.71	7.83			
Combination II															
	0	2.44											7.23	4.79	AT WET WELL
0	2030	2.59	2030	250	DI-K9	140	1604	0.545	845	2.4	0.24	2.64	4.59	2.00	AT STP SITE
									TOTAL	2.4	0.24	2.64			
Combination III															
	0	2.44											5.68	3.24	AT WET WELL
0	2030	2.59	2030	300	DI-K9	140	1604	0.378	2054	0.99	0.10	1.09	4.59	2.00	AT STP SITE
									TOTAL	0.99	0.10	1.09			
Combination IV															
	0	2.44											5.11	2.67	AT WET WELL
0	2030	2.59	2030	350	DI-K9	140	1604	0.278	4352	0.47	0.05	0.52	4.59	2.00	AT STP SITE
									TOTAL	0.47	0.05	0.52			
Combination V															
	0	2.44											4.85	2.41	AT WET WELL
0	2030	2.59	2030	400	DI-K9	140	1604	0.213	8339	0.24	0.02	0.26	4.59	2.00	AT STP SITE
									TOTAL	0.24	0.02	0.26			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	8.03	6.08	0.608	14.72	7.12	0.712	15.86
II	8.03	2.05	0.205	10.29	2.4	0.24	10.67
III	8.03	0.84	0.084	8.95	0.99	0.099	9.12
IV	8.03	0.4	0.04	8.47	0.47	0.047	8.55
V	8.03	0.21	0.021	8.26	0.24	0.024	8.29

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	1472	15	7	10	1604	16	8	10
II	1472	10	5	5	1604	11	5	10
III	1472	9	4	5	1604	9	5	5
IV	1472	8	4	5	1604	9	4	5
V	1472	8	4	5	1604	8	4	5

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	10	63000	630000	10	63000	630000	150817	780817
II	5	75000	375000	10	63000	630000	150817	525817
III	5	75000	375000	5	75000	375000	89772	464772
IV	5	75000	375000	5	75000	375000	89772	464772
V	5	75000	375000	5	75000	375000	89772	464772

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		10						
Combination No.	Intermediate Stage				Ultimate Stage					Total cost			
	BHP	Units	Cost	Capitalised	BHP	Units	Cost	Capitalised cost	Equ.cost				
I	7	44307	443070	4044824	8	52084	520840	4754793	1138260	5183083			
II	5	30976	309760	2827825	5	35027	350270	3197645	765491	3593316			
III	4	26989	269890	2463849	5	29930	299300	2732335	654099	3117948			
IV	4	25486	254860	2326639	4	28035	280350	2559339	612685	2939324			
V	4	24898	248980	2272960	4	27185	271850	2481742	594109	2867069			

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/ m	Total cost
I	200 DI K9	2030	2507	5089210
		TOTAL		5089210
II	250 DI K9	2030	3367	6835010
		TOTAL		6835010
III	300 DI K9	2030	4251	8629530
		TOTAL		8629530
IV	350 DI K9	2030	5188	10531640
		TOTAL		10531640
V	400 DI K9	2030	6226	12638780
		TOTAL		12638780

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	5089210	780817	5870027
II	6835010	525817	7360827
III	8629530	464772	9094302
IV	10531640	464772	10996412
V	12638780	464772	13103552

TABLE 8. Cost of installation and maintenance			
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance
1	2	3	4. (2 + 3)
I	5870027	5183083	11053110
II	7360827	3593316	10954143
III	9094302	3117948	12212250
IV	10996412	2939324	13935736
V	13103552	2867069	15970621

Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
5.	6.	7.
200 DI K9	10	10
250 DI K9	5	10
300 DI K9	5	5
350 DI K9	5	5
400 DI K9	5	5

Hence Combination II consisting of 250 DI K9 2030 m x 5 HP is found to be economical

DESIGN OF SEWAGE WET WELLS, PUMPING MAIN & PUMP SETS
ELAMKULAM STP-From WW2 (Block 12B) to IC@ST

(ref: CPHEEO Manual-4.20-Sewage pumping main are designed water pumping mains. The exception being that the design practice of economical size of pumping mains in conjunction with the electrical energy of the pump sets as used in water pumping mains is not applicable in sewage pumping mains. This is due to varying rates of discharge through the 24 hours like low, average and peak flows through the same main at various parts of the day and night.

During execution the total head for pumpsets should be calculated considering the wastage due to valves and specials actually used.

In the design 10% of the friction loss is included as minor loss to take care of this.

Basic Data

Block No.	TM ends at	IL at the end of TM as per SNW Design	Ult.Peak Flow as per SNW Design. (lps)	Pumping main					
				From	To	Length m	Flow ult.peak flow (3 DWF)	GL	
								From	To
12A	WW1	-0.83	80.15	WW1	WW2	2030	80.15	2.44	1.59
12B	WW2	-2.16	78.311	WW2	IC@STP	3500	158.461	1.59	1.98

Pumping main from WW2 to IC@STP

Ultimate peak flow **158.46 lps** 9507.66 lpm

Flow in MLD

Stage	Year	Flow in MLD
Initial	2025	11.50
Intermediate	2040	12.59
Ultimate	2055	13.69

Length of Pumping Main		3500.00 m
Top level of Inlet chamber		7.98 m
Hours of pumping		24.00 hrs
Residual Head		2.00 m
FOOT VALVE LEVEL		-4.77 m
Static head including Residual Head		14.75 m

RESULTS

SEWAGE QUANTITY

Discharge (3 DWI

Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		Pipe size and type	Pumpset Capacity (HP) (Intermediate)	Pipe size and type	Pumpset Capacity (HP) (Base year to Intermediate) (e)	Pumpset Capacity (HP) (Inter. To Ultimate)	Inter.	Ult
							Available		Available	Available		
Initial	2025	11.50	7986	133.10	ECP-3-DWF	400 DI K9	70.00	350 DI K9	100.00	120.00	1.52	1.65
Intermediate	2040	12.59	8743	145.72								
Ultimate	2055	13.69	9507	158.45								

Discharge (2 DWI

Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		Pipe size and type	Pumpset Capacity (HP) (Intermediate)	Pipe size and type	Pumpset Capacity (HP) (Base year to Intermediat e)	Pumpset Capacity (HP) (Inter. To Ultimate)	Inter.	Ult
							Available		Available	Available		
Initial	2025	7.66	5319	88.66	ECP-2-DWF	400 DI K9	40.00	350 DI K9	45.00	55.00	1.01	1.10
Intermediate	2040	8.40	5833	97.22								
Ultimate	2055	9.12	6333	105.56								

Discharge (1 DWI

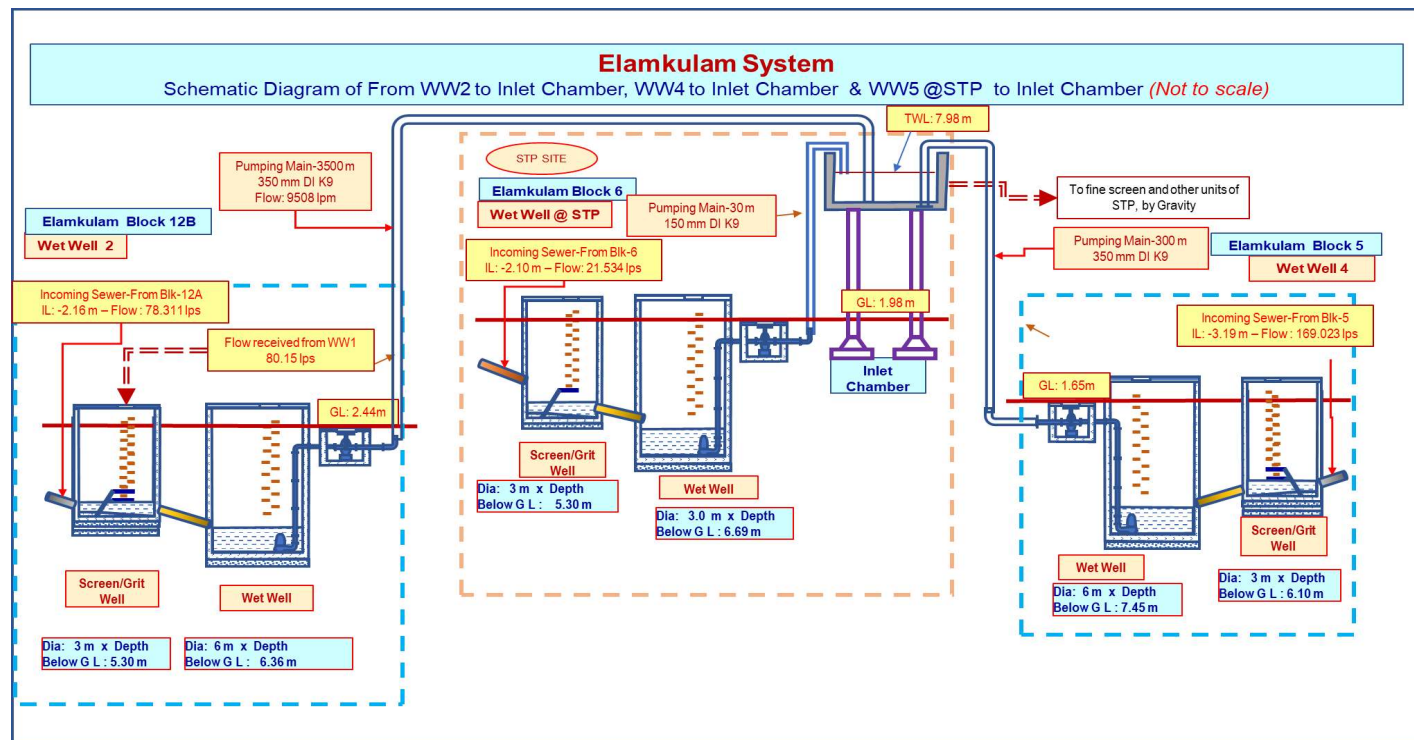
Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		Pipe size and type	Pumpset Capacity (HP) (Intermediate)	Pipe size and type	Pumpset Capacity (HP) (Base year to Intermediate) (e)	Pumpset Capacity (HP) (Inter. To Ultimate)	Inter.	Ult
							Available		Available	Available		
Initial	2025	3.83	2660	44.33	ECP-1-DWF	300 DI K9	20.00	350 DI K9	20.00	20.00	0.51	0.55
Intermediate	2040	4.20	2917	48.61								
Ultimate	2055	4.56	3167	52.78								

PROVIDE PUMPING MAIN OF 350 DI K9 SIZE

RESULTS

Size of main 350 DI K9				CHECK	
PUMPSETS					
During the period from 2025 to 2040 (considering 15 years as life of pumpse					
Provide	50 HP x	2 NO.		100	100
Provide	20 HP x	1 NO.			
Standby	20 HP x	1 NO.			
PUMP SET OPERATING PLAN (Tentative)					
Lean period (1 DWI	20 HP x	1 NO.		20	20.00
Lean period (1 DWI	0 HP x	1 NO.		0	
Ave, flow (2 DWI	50 HP x	1 NO.		50	45.00
+	0 HP x	1 NO.		0	
Peak, flow (3 DWI	50 HP x	2 NO.		100	100.00
+	0 HP x	1 NO.		0	
During the period from 2040 to 2055 (considering 15 years as life of pumpse					
Provide	50 HP x	2 NO.		100	120
Provide	20 HP x	1 NO.		20	
Standby	5 HP x	1 NO.			
PUMP SET OPERATING PLAN (Tentative)					
Lean period (1 DWI	20 HP x	1 NO.		20	20.00
Lean period (1 DWI	0 HP x	1 NO.		0	

Ave, flow (2 DW	50 HP x	1 NO.	50	55.00
	+ 5 HP x	1 NO.	5	
Peak, flow (3 DW	50 HP x	2 NO.	100	120.00
Peak, flow (3 DW	20 HP x	1 NO.	20	
For Estimate of pump sets propose (Intermediat				
50 HP x 2 No. + 20 HP x 1 No. + 20 HP x 1 No. Standby				



ELAMKULAM STP-From WW2 (Block 12B) to IC@STP			
Design/Input Data			
Sr. No.	Description	Values	Unit
Input values			
1	Average Flow	11.50	MLD
2	Intermediate Flow	12.59	MLD
3	Peak Flow	13.69	MLD
4	GL at WW2 site	1.59	m
5	IL of Incoming Sewer	-2.16	m
6	Length of Rising Main	3500.00	m
7	TWL of Inlet chamber at STP	7.98	m
8	Dia of incoming sewer	0.50	m
9	d/D of incoming sewer	0.62	
10	Velocity in sewer at peak design Ultimate flow	0.78	m/s
11	Residual Head	2.00	m
Output values			
1	Average Flow	479.17	m ³ /hr
2	Peak Flow	570.42	m ³ /hr
3	Suction Depth (Depth of SPS)	6.36	m

ELAMKULAM STP-From WW2 (Block 12B) to IC@ST			
Diameter required for Screen/Grit well			
Data			
Average Flow	11.500	MLD	
Peak Design Flow	13.690	MLD	
	0.158	m ³ /s	0.158
Inner Dia of incoming sewer	0.500	m	OD: 0.25
d/D	0.620		
Depth of flow in sewer at peak flow	0.310	m	0.2
Velocity in sewer at peak design Ultimate flow	0.780	m/s	
Drop of screen chamber floor to invert	0.080	m	
G.L of Screen well	1.590	m	
I.L of Screen Well	-2.160	m	
Assumed width of bars	10	mm	
Clear spacing between bars	25	mm	
Design of Bar Rack (Screen)			
Type of Screening		Manual	
Assume Velocity through screen	0.7	m/s	0.7
Clear area of openings through the rack	0.226	m ²	0.226
Clear width of openings through the rack	0.730	m	1.132
Number of clear spacings	29.000		
So number of bars	28.000		
Total width of the Screen	1.000	m	
Projected fixtures width each side	0.150	m	
Total width of the Screen	1.300	m	
Angle of Inclination of Bar	45 °		
→Angle of Inclination should be 75 °-85° in Mechanically Cleaned and 45° in Manually			
Height above G.L	1.000	m	
Total depth of Bar Rack	1.300	m	
Sin 45°	0.707		
Slant height of Screen	1.900	m	
Tan 45°	1.000		
Horizontal length of Screen	1.300		
Length between pipe and screen	0.600	m	
Length between screen and Effluent pipe(To accommodat grit pump & operating platform)	1.500	m	
Total Length of the chamber	3.000	m	
Providing Manual Screen of Size 1.3 m Width X 1.9 m Height			
Providing well internal diameter of Screen/Grit Well 3 m			

Design of Grit Well

Peak Flow	=	9507.000	lpm
Average Flow	=	7986.000	lpm
Ground Level	=	1.590	m
Invert Level of Incoming	=	-2.160	m
Size of Approach Sewer	=	500.000	mm

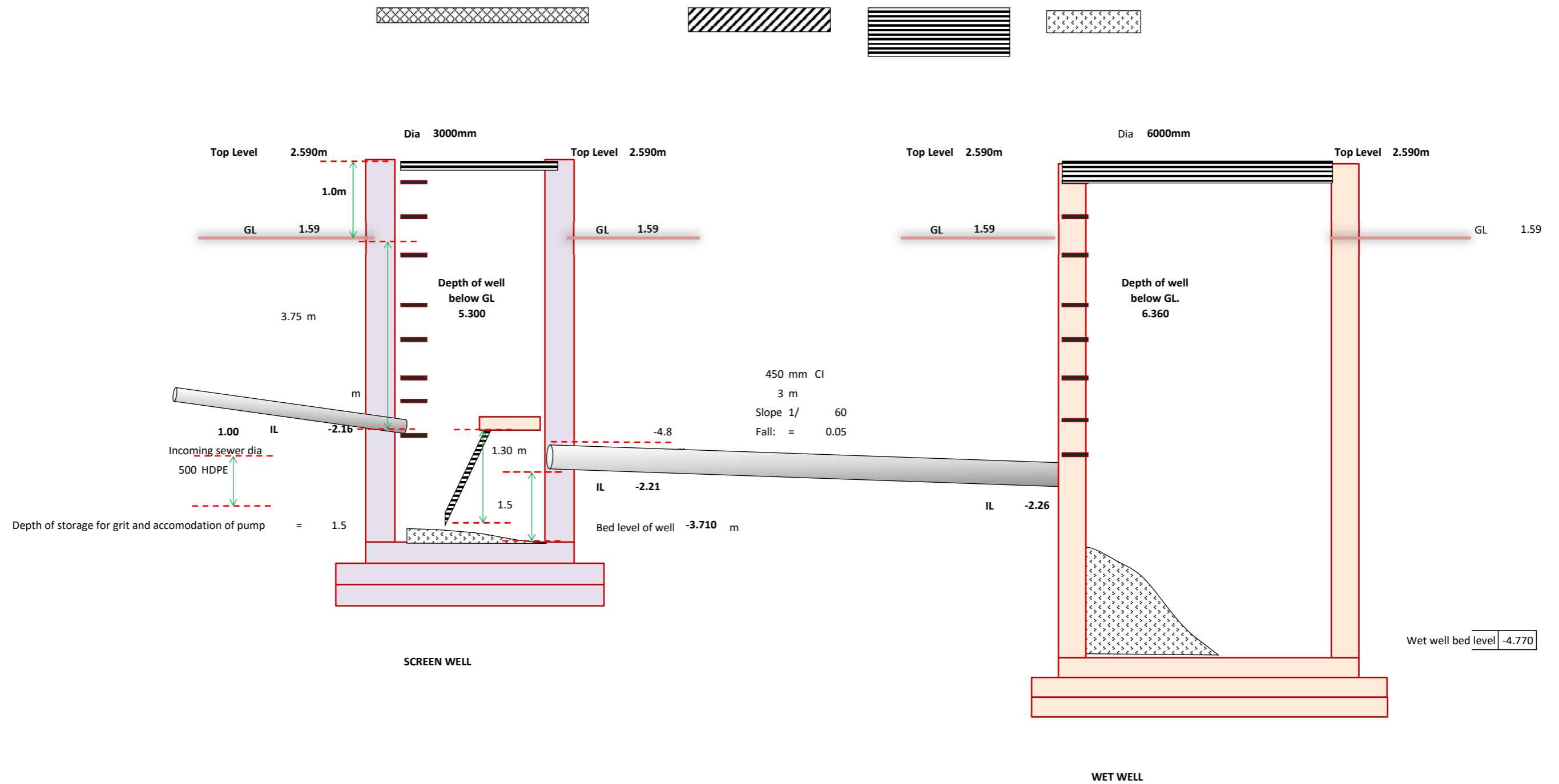
Volume of grit collection

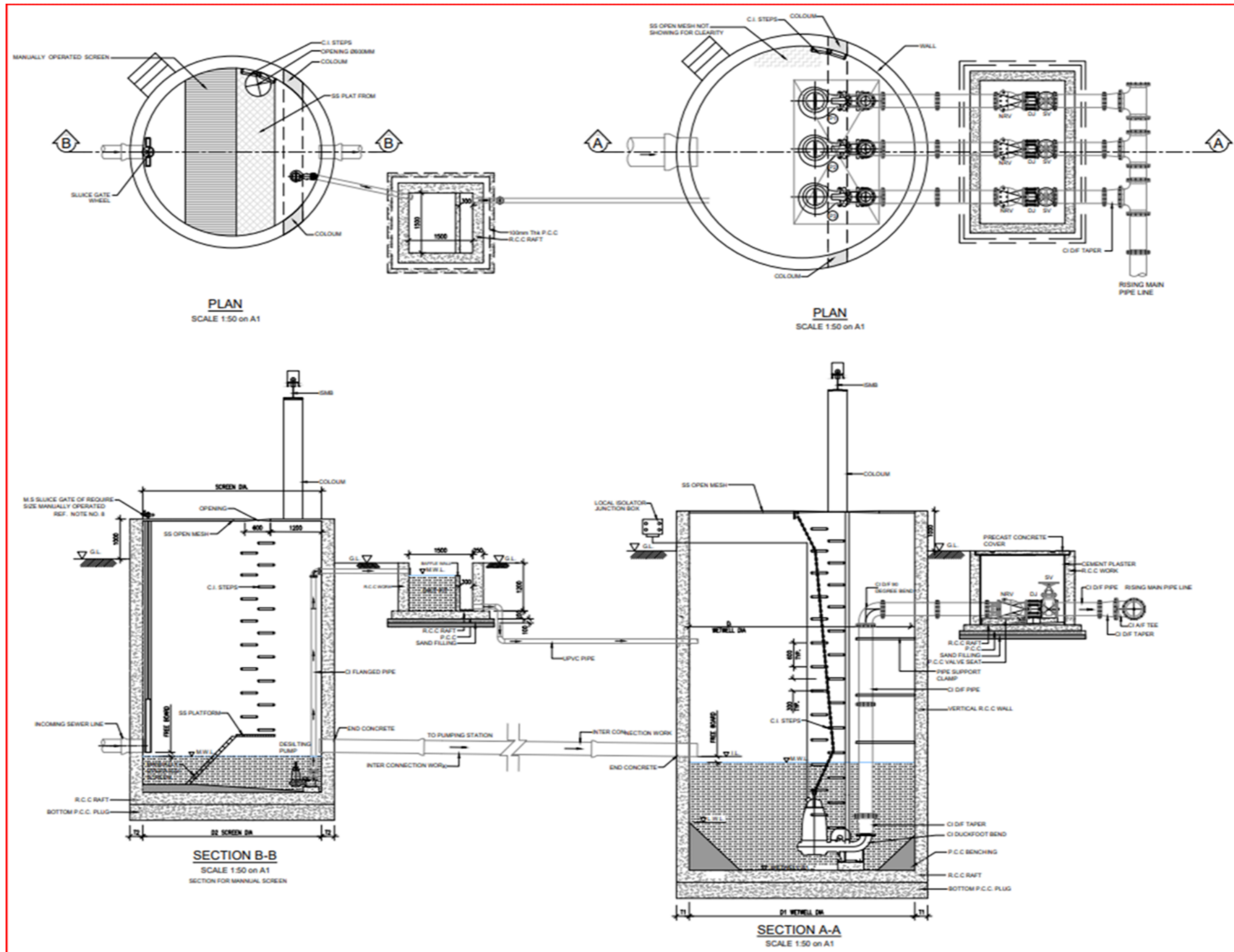
As per CPHEEO Manual, volume of grit generated is 0.05 to 0.15 cu.m / ML

hence, take maximum, $0.15 = 0.15 \times 1000 \text{ m}^3 / \text{Mm}^3$
 $= 150 \text{ m}^3 / \text{Mm}^3$

Diameter required for Screen/Grit well	
This quantity is for 24 hrs, hence, per hour flow	= 150 / 24
	= 6.25 m ³ / mm ³
The quantity increases 3 to 4 times during peak	
Taking average, 3.5	= 3.5 x 6.25
	= 21.875 m ³ / mm ³
This quantity lasts for 2 to 3 hours in Morning and evening	
Hence, taking the maximum hours of	= 3
Volume = 3 x 21.88	= 65.625 m ³ / mm ³
For 5 hours of normal flow =	= 6.250 x 5
	= 31.250 m ³ / mm ³
Therefore for total / day	= 96.875 m ³ / mm ³
Volume of grit collected / day	= 9507 x 60 x 24 96.88
	1000 10 ⁶
	= 1.326 cu.m
Volume of Storage required	= 1.326 cu.m
Assuming dia of well as	= 3.00 m
Area of well	= 7.069 sq.m
Depth of Storage required	= 0.188 m
Total depth of Bar Rack	= 1.300
Total depth requird.	= 1.488
Provide a minimum depth of	= 1.50 Min. 1.20 to accomo
Check:	
Volume provided	= 22 x 3 x 3 x 1.5 x 2
	= 7 x 4
	= 7.070 cu.m
No. of days	= 7.070 / 1.33
	= 5.331 days
Depth of Grit well	
G.L	= 1.590 m
I.L of incoming pipe	= -2.160 m
Depth of storage for grit and accomodation of pump	= 1.500 m
Total depth	= 5.250 m
Provide a Total depth below GL.	= 5.300 m

ELAMKULAM STP-From WW2 (Block 12B) to IC@STP				
Design/Input Data				
Wet Well Calculations				
Sr. No.	Description	Unit	Value	Remark
Basic details				
1	Peak Flow	m ³ /hr	570.417	
wet well design				
1	Time for one pump cycle for ultimate design stage	min	15.00	CPHEEP manual part A; 4.6.6
2	wet well capacity required for ultimate design stage	m ³	35.651	
3	Assumed sewage depth in wet well	m	1.500	
4	Area required for wet well	m ²	23.767	
5	Diameter required for wet well	m	5.501	
6	Diameter provided for wet well	m	6.000	
7	Actual provided wet well area	m ²	28.274	
8	Actual provided wet well capacity	m ³	42.412	
9	Ground level at wet well site	m	1.590	
10	Invert level of incoming sewer in wet well	m	-2.270	
11	Difference between MWL in wet well and incoming	m	0.100	
12	Maximum water level in wet well (MWL)	m	-2.370	
13	Lowest water level in wet well (LWL)	m	-3.870	
14	Required pump submergence depth	m	0.900	
15	Wet well bed level	m	-4.770	
wet well dimensions				
1	Total wet well depth	m	6.360	
2	Wet well diameter required	m	6.000	
3	Wet well diameter to be provided	m	6.000	





Valve Chamber		
Length	2.30	m
Breadth	3.80	m
Total Depth	1.90	m
penstock depth-Grit /screen	4.00	m
penstock depth-Suction well	4.00	m
Silt Pit		
Length	1.5	m
Width	1.5	m
Depth	1.2	m

Valve Chamber*			
Dia, mm	L, m	B, m	D, m
100	1.4	3.3	1.4
150	1.5	3.4	1.5
200	1.6	3.5	1.5
250	1.8	3.5	1.6
300	1.9	3.6	1.7
350	2.1	3.7	1.8
400	2.3	3.8	1.9
450	2.4	3.9	2.1
500	2.4	3.9	2.2
600	2.8	4.7	2.4
700	2.9	4.8	2.7
750	2.9	4.8	2.8
800	3	4.9	3
900	3.1	5	3.2
1000	3.2	5.1	3.4

SPS DATA		
Depth of Suction Well	6.36	m
Dia of Suction Well	6.00	m
Pump HP	40.00	HP
RM Delivery Pipe Dia.	400.00	mm
SCREEN WELL DATA		
G.L	1.59	m
I.L of incoming pipe	-2.16	m
Dia of Grit Well	3.00	m
Incoming Pipe Dia. Of Network	500.00	mm
Total width of the Screen	1.30	m
Slant height of Screen	1.90	m
Depth	5.30	m

SOURCE :	
wt.of 25x3 mm flat=0.59 kg/m	0.59
wt.of 12x3 mm flat=0.28 kg/m	0.28
wt.of 25x6 mm flat=1.18 kg/m	1.18
wt.of 50x10 mm flat=3.92 kg/m	3.92
wt.of 50x50 x6mm angle=4.47 kg/m	4.47
wt.of 150x75 x10mm angle=16.9 kg/m	16.9
wt.of ISMB 300mm =42.2 kg/m	42.2
wt.of ISMB 400mm =66.3 kg/m	66.3
wt.of ISMB 600mm =122 kg/m	122

Pipe Depth at IntCon.	4.00	m
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Grit Well					
Design of Grit Well					
Depth of Grit Well	5.30	m	Total Depth(m	6.35	
Parapet Height	1.00	m	outer dia (n	3.9	
Total Height of well + Parapet	6.30	m	centre dia(n	3.45	
Dia of Grit Well	3	m	raft dia(n	3.00	
Thickness of wall	0.45	m	Screen Horizontal platform width(n	1.5	
Thickness of Raft Slab	0.45	m	Screen Mesh Opening(m	0.6	
Thickness of Plugging	0.30	m			
Design of kerb					
Diameter of grit well	3.00	m	Extra width for Excavation for working including both sides	1.2	
Well wall thickness	0.45	m	Benching depth assumed	0.25	
Kerb wall thickness at top	0.53	m			
Kerb wall thickness at bottom	0.15	m			
kerb height outer	1.05	m			
kerb height inner	0.45	m			
kerb height outer excluding inner	0.60	m			
kerb slope	0.71	m			
Thickness of raft	0.45	m			
Thickness of plugging	0.30	m			
Circumference of well kerb (11.07	m			
Volume of Kerb	4.86	cu.m			

Suction Well					
Design Data					
Depth of Suction Well	6.36	m		Screen Mesh Opening for Pump	
Parapet Height	1.00	m		Length(n	1.5
Total Height of well + Parapet	7.36	m		Breadth(n	1.5
Dia of Suction Well	6.00	m		Outer Dia (m	7.2
Thickness of wall	0.6	m		Center Dia (m	6.60
Thickness of Raft Slab	0.6	m		Raft Dia (n	6.00
Thickness of Plugging	0.4	m		Total Depth	7.69
Design of kerb					
Diameter of wall	6.00	m			
Well wall thickness	0.60	m			
Kerb wall thickness at top	0.68	m			
Kerb wall thickness at bottom	0.15	m			
kerb height outer	1.33	m			
kerb height inner	0.60	m			
kerb height outer excluding inner	0.73	m			
kerb slope	0.90	m			
Thickness of raft	0.60	m			
Thickness of plugging	0.40	m			
Circumference of well kerb (20.97	m			
Volume of Kerb	4.50	cu.m			

DESIGN OF PUMPING MAIN FROM WET WELL for Perandoor 1A at STP to Receiving Chamber

BASIC DATA		
GL AT Wet well site	1.590	m
Top level of receiving chamber	7.980	m
Residual Head	2.000	m
TOTAL HGL REQUIRED AT END	7.980	m
FOOT VALVE LEVEL	-4.770	m
Static head including Residual Head	14.750	m
Number of reaches	1	
Length	3500	m

Combination	Pipes selected
I	200 DI K9
II	250 DI K9
III	300 DI K9
IV	350 DI K9
V	400 DI K9

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Vclcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	1.59											330.82	329.23	AT WET WELL
0	3500	7.98	3500	200	DI-K9	140	8743	4.638	12	291.67	29.17	320.84	9.98	2.00	AT STP SITE
									TOTAL	291.67	29.17	320.84			
Combination II															
	0	1.59											114.03	112.44	AT WET WELL
0	3500	7.98	3500	250	DI-K9	140	8743	2.969	37	94.59	9.46	104.05	9.98	2.00	AT STP SITE
									TOTAL	94.59	9.46	104.05			

Combination III															
	0	1.59											53.24	51.65	AT WET WELL
0	3500	7.98	3500	300	DI-K9	140	8743	2.061	89	39.33	3.93	43.26	9.98	2.00	AT STP SITE
									TOTAL	39.33	3.93	43.26			
Combination IV															
	0	1.59											30.46	28.87	AT WET WELL
0	3500	7.98	3500	350	DI-K9	140	8743	1.515	188	18.62	1.86	20.48	9.98	2.00	AT STP SITE
									TOTAL	18.62	1.86	20.48			
Combination V															
	0	1.59											20.65	19.06	AT WET WELL
0	3500	7.98	3500	400	DI-K9	140	8743	1.16	361	9.7	0.97	10.67	9.98	2.00	AT STP SITE
									TOTAL	9.7	0.97	10.67			
ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (n		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	1.59											359.98	358.39	AT WET WELL
0	3500	7.98	3500	200	DI-K9	140	9507	5.044	11	318.18	31.82	350.00	9.98	2.00	AT STP SITE
									TOTAL	318.18	31.82	350.00			
Combination II															
	0	1.59											134.17	132.58	AT WET WELL
0	3500	7.98	3500	250	DI-K9	140	9507	3.228	31	112.9	11.29	124.19	9.98	2.00	AT STP SITE
									TOTAL	112.9	11.29	124.19			
Combination III															
	0	1.59											60.64	59.05	AT WET WELL
0	3500	7.98	3500	300	DI-K9	140	9507	2.242	76	46.05	4.61	50.66	9.98	2.00	AT STP SITE
									TOTAL	46.05	4.61	50.66			
Combination IV															
	0	1.59											33.89	32.30	AT WET WELL
0	3500	7.98	3500	350	DI-K9	140	9507	1.647	161	21.74	2.17	23.91	9.98	2.00	AT STP SITE
									TOTAL	21.74	2.17	23.91			

Combination V																
	0	1.59											22.44	20.85	AT WET WELL	
0	3500	7.98	3500	400	DI-K9	140	9507	1.261	309	11.33	1.13	12.46	9.98	2.00	AT STP SITE	
									TOTAL	11.33	1.13	12.46				
TABLE 2. TOTAL HEAD								TABLE 3. HORSE POWER								
Comb inatio n No.	STATIC HEAD	Intermediate Stage			Ultimate stage			Combinat ion No.	Intermediate Stage				Ultimate Stage			
		Friction loss	Other loss	Total head	Fricti on loss	Other loss	Total head		Disc. In lpm	Head in 'm'	Actual BHP	Availabl e	Disc. In lpm	head in 'm'	Actual BHP	Available
I	14.75	291.67	29.167	335.59	318.2	31.82	364.75	I	8743	336	918	920	9507	365	1086	1090
II	14.75	94.59	9.459	118.80	112.9	11.29	138.94	II	8743	119	325	330	9507	139	413	415
III	14.75	39.33	3.933	58.01	46.05	4.605	65.41	III	8743	58	159	160	9507	65	195	195
IV	14.75	18.62	1.862	35.23	21.74	2.174	38.66	IV	8743	35	96	100	9507	39	115	120
V	14.75	9.7	0.97	25.42	11.33	1.133	27.21	V	8743	25	70	70	9507	27	81	85

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	920	50000	46000000	1090	50000	54500000	13046867	59046867
II	330	50000	16500000	415	50000	20750000	4967385	21467385
III	160	50000	8000000	195	50000	9750000	2334072	10334072
IV	100	46000	4600000	120	50000	6000000	1436352	6036352
V	70	46000	3220000	85	46000	3910000	936023	4156023

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		10							
Combination	Intermediate Stage				Ultimate Stage					Total cost				
	BHP	Units	Cost	Capitalised	BHP	Units	Cost	Capitalised cost	Equ.cost					
I	918	6002165	60021650	547942761	1086	7093699	70936990	647589830	155027857	702970618				
II	325	2124777	21247770	193972704	413	2702141	27021410	246680756	59053412	253026116				
III	159	1037621	10376210	94725306	195	1272030	12720300	116124703	27799331	122524637				
IV	96	630166	6301660	57528391	115	751912	7519120	68642688	16432514	73960905				
V	70	454637	4546370	41504199	81	529266	5292660	48317144	11566740	53070940				

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	200 DI K9	3500	2507	8774500
		TOTAL		8774500
II	250 DI K9	3500	3367	11784500
		TOTAL		11784500
III	300 DI K9	3500	4251	14878500
		TOTAL		14878500
IV	350 DI K9	3500	5188	18158000
		TOTAL		18158000
V	400 DI K9	3500	6226	21791000
		TOTAL		21791000

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	8774500	59046867	67821367
II	11784500	21467385	33251885
III	14878500	10334072	25212572
IV	18158000	6036352	24194352
V	21791000	4156023	25947023

TABLE 8. Cost of installation and maintenance

Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cos	Total cost installation & maintenance	Pipe Size	Inter.	Ult.
					Pump set	Pump set Cap.
1	2	3	4. (2 + 3)	5.	6.	7.
I	67821367	702970618	770791985	200 DI K9	920	1090
II	33251885	253026116	286278001	250 DI	330	415
III	25212572	122524637	147737209	300 DI K9	160	195
IV	24194352	73960905	98155257	350 DI K9	100	120
V	25947023	53070940	79017963	400 DI	70	85

Hence Combination V consisting of 400 DI K9 3500 m x 70 HP is found to be economical

DESIGN OF PUMPING MAIN FROM WET WELL TO PROPOSED STP

BASIC DATA		
GL AT Wet well site	1.590	m
Top level of receiving chamber	7.980	m
Residual Head	2.000	m
TOTAL HGL REQUIRED AT END	7.980	m
FOOT VALVE LEVEL	-4.770	m
Static head including Residual Head	14.750	m
Number of reaches	1	
Length	3500	m

Combination	Pipes selected
I	200 DI K9
II	250 DI K9
III	300 DI K9
IV	350 DI K9
V	400 DI K9

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (n		GL	Distance (m)	Pipe			Disc. In lpm	Vclcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	1.59											158.06	156.47	AT WET WELL
0	3500	7.98	3500	200	DI-K9	140	5833	3.095	26	134.62	13.46	148.08	9.98	2.00	AT STP SITE
									TOTAL	134.62	13.46	148.08			
Combination II															
	0	1.59											59.98	58.39	AT WET WELL
0	3500	7.98	3500	250	DI-K9	140	5833	1.981	77	45.45	4.55	50.00	9.98	2.00	AT STP SITE
									TOTAL	45.45	4.55	50.00			
Combination III															
	0	1.59											30.46	28.87	AT WET WELL
0	3500	7.98	3500	300	DI-K9	140	5833	1.375	188	18.62	1.86	20.48	9.98	2.00	AT STP SITE
									TOTAL	18.62	1.86	20.48			

Combination IV															
	0	1.59											19.65	18.06	AT WET WELL
0	3500	7.98	3500	350	DI-K9	140	5833	1.011	398	8.79	0.88	9.67	9.98	2.00	AT STP SITE
									TOTAL	8.79	0.88	9.67			
Combination V															
	0	1.59											15.02	13.43	AT WET WELL
0	3500	7.98	3500	400	DI-K9	140	5833	0.774	764	4.58	0.46	5.04	9.98	2.00	AT STP SITE
									TOTAL	4.58	0.46	5.04			
ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (n		GL	Distance (m)	Pipe			Disc. In lpm	Velcity- mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	1.59											184.98	183.39	AT WET WELL
0	3500	7.98	3500	200	DI-K9	140	6333	3.36	22	159.09	15.91	175.00	9.98	2.00	AT STP SITE
									TOTAL	159.09	15.91	175.00			
Combination II															
	0	1.59											68.31	66.72	AT WET WELL
0	3500	7.98	3500	250	DI-K9	140	6333	2.15	66	53.03	5.30	58.33	9.98	2.00	AT STP SITE
									TOTAL	53.03	5.30	58.33			
Combination III															
	0	1.59											33.74	32.15	AT WET WELL
0	3500	7.98	3500	300	DI-K9	140	6333	1.493	162	21.6	2.16	23.76	9.98	2.00	AT STP SITE
									TOTAL	21.6	2.16	23.76			
Combination IV															
	0	1.59											21.23	19.64	AT WET WELL
0	3500	7.98	3500	350	DI-K9	140	6333	1.097	342	10.23	1.02	11.25	9.98	2.00	AT STP SITE
									TOTAL	10.23	1.02	11.25			
Combination V															
	0	1.59											15.85	14.26	AT WET WELL
0	3500	7.98	3500	400	DI-K9	140	6333	0.84	656	5.34	0.53	5.87	9.98	2.00	AT STP SITE
									TOTAL	5.34	0.53	5.87			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	14.75	134.62	13.462	162.83	159.1	15.91	189.75
II	14.75	45.45	4.545	64.75	53.03	5.303	73.08
III	14.75	18.62	1.862	35.23	21.6	2.16	38.51
IV	14.75	8.79	0.879	24.42	10.23	1.023	26.00
V	14.75	4.58	0.458	19.79	5.34	0.534	20.62

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	5833	163	297	300	6333	190	376	380
II	5833	65	118	120	6333	73	145	145
III	5833	35	64	65	6333	39	76	80
IV	5833	24	45	45	6333	26	52	55
V	5833	20	36	40	6333	21	41	45

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	300	50000	15000000	380	50000	19000000	4548449	19548449
II	120	50000	6000000	145	50000	7250000	1735592	7735592
III	65	46000	2990000	80	46000	3680000	880963	3870963
IV	45	47000	2115000	55	46000	2530000	605662	2720662
V	40	47000	1880000	45	47000	2115000	506314	2386314

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		10									
Comb inatio	Intermediate Stage				Ultimate Stage					Total cost						
	BHP	Units	Cost	Capitalised	BHP	Units	Cost	Capitalised cost	Equ.cost							
I	297	1943105	19431050	177387712	376	2458387	24583870	224428245	53726338	231114050						
II	118	772628	7726280	70533869	145	946850	9468500	86438744	20692748	91226617						
III	64	420459	4204590	38384061	76	498944	4989440	45549023	10904074	49288135						
IV	45	291394	2913940	26601607	52	336877	3368770	30753789	7362212	33963819						
V	36	236108	2361080	21554501	41	267215	2672150	24394285	5839798	27394299						

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	200 DI K9	3500	2507	8774500
		TOTAL		8774500
II	250 DI K9	3500	3367	11784500
		TOTAL		11784500
III	300 DI K9	3500	4251	14878500
		TOTAL		14878500
IV	350 DI K9	3500	5188	18158000
		TOTAL		18158000
V	400 DI K9	3500	6226	21791000
		TOTAL		21791000

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	8774500	19548449	28322949
II	11784500	7735592	19520092
III	14878500	3870963	18749463
IV	18158000	2720662	20878662
V	21791000	2386314	24177314

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cos	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	2	3	4. (2 + .	5.	6.	7.
I	28322949	231114050	259436999	200 DI K9	300	380
II	19520092	91226617	110746709	250 DI K9	120	145
III	18749463	49288135	68037598	300 DI K9	65	80
IV	20878662	33963819	54842481	350 DI K9	45	55
V	24177314	27394299	51571613	400 DI K9	40	45

Hence Combination V
consisting of 400 DI K9 3500 m x 40 HP
is found to be economical

DESIGN OF PUMPING MAIN FROM WET WELL TO PROPOSED STP

BASIC DATA		
GL AT Wet well site	1.59	m
Top level of receiving chamber	7.98	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	7.98	m
FOOT VALVE LEVEL	-4.77	m
Static head including Residual Head	14.75	m
Number of reaches	1	
Length	3500	m

Combination	Pipes selected
I	200 DI K9
II	250 DI K9
III	300 DI K9
IV	350 DI K9
V	400 DI K9

INTERMEDIATE STAGE																
TABLE1. FRICTION LOSS																
Chainage (n		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS	
Start	End			Size in mm	Type & Class	C' value										
Combination I																
	0	1.59											50.93	49.34	AT WET WELL	
0	3500	7.98	3500	200	DI-K9	140	2917	1.547	94	37.23	3.72	40.95	9.98	2.00	AT STP SITE	
									TOTAL	37.23	3.72	40.95				
Combination II																
	0	1.59											23.77	22.18	AT WET WELL	
0	3500	7.98	3500	250	DI-K9	140	2917	0.99	279	12.54	1.25	13.79	9.98	2.00	AT STP SITE	
									TOTAL	12.54	1.25	13.79				
Combination III																
	0	1.59											15.65	14.06	AT WET WELL	
0	3500	7.98	3500	300	DI-K9	140	2917	0.688	679	5.15	0.52	5.67	9.98	2.00	AT STP SITE	
									TOTAL	5.15	0.52	5.67				

Combination IV															
	0	1.59											12.65	11.06	AT WET WELL
0	3500	7.98	3500	350	DI-K9	140	2917	0.505	1438	2.43	0.24	2.67	9.98	2.00	AT STP SITE
									TOTAL	2.43	0.24	2.67			
Combination V															
	0	1.59											11.38	9.79	AT WET WELL
0	3500	7.98	3500	400	DI-K9	140	2917	0.387	2756	1.27	0.13	1.40	9.98	2.00	AT STP SITE
									TOTAL	1.27	0.13	1.40			
ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (n		GL	Distance (m)	Pipe			Disc. In lpm	Velcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	1.59											57.51	55.92	AT WET WELL
0	3500	7.98	3500	200	DI-K9	140	3167	1.68	81	43.21	4.32	47.53	9.98	2.00	AT STP SITE
									TOTAL	43.21	4.32	47.53			
Combination II															
	0	1.59											26.02	24.43	AT WET WELL
0	3500	7.98	3500	250	DI-K9	140	3167	1.075	240	14.58	1.46	16.04	9.98	2.00	AT STP SITE
									TOTAL	14.58	1.46	16.04			
Combination III															
	0	1.59											16.58	14.99	AT WET WELL
0	3500	7.98	3500	300	DI-K9	140	3167	0.747	583	6	0.60	6.60	9.98	2.00	AT STP SITE
									TOTAL	6	0.60	6.60			
Combination IV															
	0	1.59											13.09	11.50	AT WET WELL
0	3500	7.98	3500	350	DI-K9	140	3167	0.549	1235	2.83	0.28	3.11	9.98	2.00	AT STP SITE
									TOTAL	2.83	0.28	3.11			
Combination V															
	0	1.59											11.61	10.02	AT WET WELL
0	3500	7.98	3500	400	DI-K9	140	3167	0.42	2367	1.48	0.15	1.63	9.98	2.00	AT STP SITE
									TOTAL	1.48	0.15	1.63			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	14.75	37.23	3.723	55.70	43.21	4.321	62.28
II	14.75	12.54	1.254	28.54	14.58	1.458	30.79
III	14.75	5.15	0.515	20.42	6	0.6	21.35
IV	14.75	2.43	0.243	17.42	2.83	0.283	17.86
V	14.75	1.27	0.127	16.15	1.48	0.148	16.38

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	2917	56	51	55	3167	62	62	65
II	2917	29	26	30	3167	31	31	35
III	2917	20	19	20	3167	21	21	25
IV	2917	17	16	20	3167	18	18	20
V	2917	16	15	15	3167	16	16	20

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	55	46000	2530000	65	46000	2990000	715782	3245782
II	30	50000	1500000	35	50000	1750000	418936	1918936
III	20	50000	1000000	25	50000	1250000	299240	1299240
IV	20	50000	1000000	20	50000	1000000	239392	1239392
V	15	58000	870000	20	50000	1000000	239392	1109392

TABLE 5. COST OF ELECTRICAL ENERGY				UNIT RATE		10							
Combination	Intermediate Stage				Ultimate Stage					Total cost			
	BHP	Units	Cost	Capitalised	BHP	Units	Cost	Capitalised cost	Equ.cost				
I	51	332368	3323680	30342158	62	403468	4034680	36832938	8817512	39159671			
II	26	170301	1703010	15546923	31	199447	1994470	18207687	4358775	19905699			
III	19	121812	1218120	11120321	21	138280	1382800	12623699	3022013	14142335			
IV	16	103971	1039710	9491601	18	115734	1157340	10565456	2529286	12020887			
V	15	96325	963250	8793591	16	106128	1061280	9688516	2319354	11112945			

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/ m	Total cost
I	200 DI K9	3500	2507	8774500
		TOTAL		8774500
II	250 DI K9	3500	3367	11784500
		TOTAL		11784500
III	300 DI K9	3500	4251	14878500
		TOTAL		14878500
IV	350 DI K9	3500	5188	18158000
		TOTAL		18158000
V	400 DI K9	3500	6226	21791000
		TOTAL		21791000

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	8774500	3245782	12020282
II	11784500	1918936	13703436
III	14878500	1299240	16177740
IV	18158000	1239392	19397392
V	21791000	1109392	22900392

TABLE 8. Cost of installation and maintenance

Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cos	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	2	3	4. (2 + .	5.	6.	7.
I	12020282	39159671	51179953	200 DI K9	55	65
II	13703436	19905699	33609135	250 DI K9	30	35
III	16177740	14142335	30320075	300 DI	20	25
IV	19397392	12020887	31418279	350 DI K9	20	20
V	22900392	11112945	34013337	400 DI K9	15	20

Hence Combination III consisting of 300 DI K9 3500 m x 20 HP is found to be economical

DESIGN OF SEWAGE WET WELLS, PUMPING MAIN & PUMP SETS

ELANKULAM STP-Block 7

From WW3 (Thevara well-Sump) to Cheruparambath well-Sump

Note:

(ref: CPHEEO Manual-4.20-Sewage pumping main are designed water pumping mains. The exception being that the design practice of economical size of pumping mains in conjunction with the electrical energy of the pump sets as used in water pumping mains is not applicable in sewage pumping mains. This is due to varying rates of discharge through the 24 hours like low, average and peak flows through the same main at various parts of the day and night.

During execution the total head for pumpsets should be calculated considering

the wastage due to valves and specials actually used.

In the design 10% of the friction loss is included as minor loss to take care of this.

Basic Data

6298.2 6902.76 7501.2

Wet Well Location and other Details

Block No	Wet Well No.		GL(m)		Length (m)	Peak.Flow (lps)		
						Initial	Intermediate	Ultimate
7	WW3 (Thevara Well)	Cheruparambath well	1.75	3.07	2550	104.97	115.046	125.02

Pumping main from WW3 to Cheruparambath well

Flow received in Thevara Well (WW3)

Flow from Block 7	11.743	lps	704.58	lpm
In Block 7, proposed LiMH at the end manhole to connect Thevara well (WW3) proposed by KMRL.			6796.62	lpm
Additional load from KWA also entering to Thevara well				
TOTAL			7501.2	lpm

Flow in MLD

Stage	Year	Flow in MLD	Flow in LPM
Initial	2025	9.07	6298.2
Intermediate	2040	9.94	6902.76
Ultimate	2055	10.80	7501.2

As sewage is pumped From the End MH (Mh:- AT RD MI9A) of Block 7 the Thevara Well will be designed as a sump and top will not have cover slab instead covered by steel Grill.

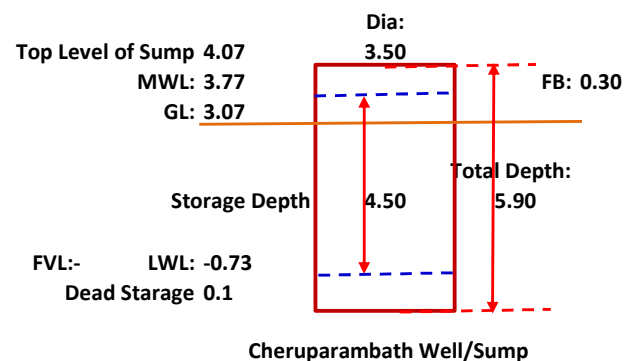
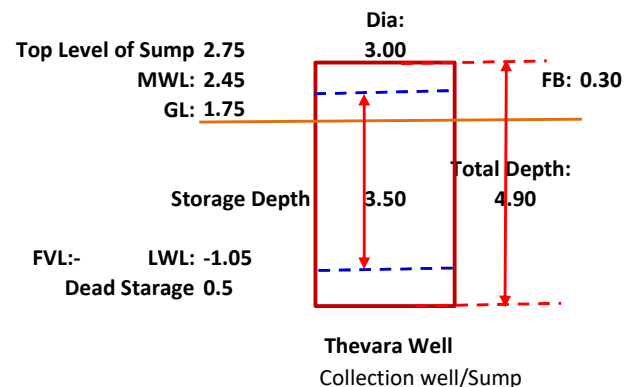
SIZE OF SUMP AT THEVARA WELL SITE

GL at Thevara Well		1.75 m
Ultimate Peak flow received in the Sump		10.80 mld
=		7501.2 lpm
Let the storage time be	3.00 minutes	
Volume required	=	22503.6 litre
	=	22.5036 m ³
Let the Diameter of Sump	=	3.00 m
Depth Required	=	3.18360816 m
	say	3.50 m
Dead storage	=	0.10 m
Free Board	=	0.30 m
Let Top level of Sump is at		1.00 m above GL
Total Depth	=	<u>4.90 m</u>
Total Depth Below GL	=	<u>3.90 m</u>
FVL of pumpset	=	-1.05 m

SIZE OF SUMP AT Cheruparambath WELL SITE

GL at Cheruparambath well site		3.07 m
Ultimate Peak flow received from Thevara well sump		7501.20 lpm
Ultimate Peak flow received from Block 8		5596.00 lpm
Total		<u>13097.20 lpm</u>
Let the storage time be	3.00 minutes	
Volume required	=	39291.6 litre
	=	39.2916 m ³
Let the Diameter of Sump	=	3.50 m
Depth Required	=	4.08388726 m
	say	4.50 m
Dead storage	=	0.10 m
Free Board	=	0.30 m
Let Top level of Sump is at		1.00 m above GL
Total Depth	=	<u>5.90 m</u>

Length of Pumping Main	2550.00	m
Top level of Cheruparambath well (Sump)	3.07	m
Hours of pumping	24.00	hrs
Residual Head	2.00	m
FOOT VALVE LEVEL	-1.05	m
Static head including Residual Head	6.12	m



RESULTS

SEWAGE QUANTITY

Discharge (3 DWF)

Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		Pipe size and type	Pumpset Capacity (HP) (Intermedi ate)	Pipe size and type	Pumpset Capacity (HP) (Base year to Intermediate)	Pumpset Capacity (HP) (Inter. To Ultimate)	Inter.	Ult
							Available		Available	Available		
Initial	2025	9.07	6298	104.97	ECP-3-DWF	400 DI K9	35.00	350 DI K9	45.00	50.00	1.20	1.30
Intermediate	2040	9.94	6903	115.05								
Ultimate	2055	10.80	7501	125.02								

Discharge (2 DWF)

Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		Pipe size and type	Pumpset Capacity (HP) (Intermedi ate)	Pipe size and type	Pumpset Capacity (HP) (Base year to Intermediate)	Pumpset Capacity (HP) (Inter. To Ultimate)	Inter.	Ult
							Available		Available	Available		
Initial	2025	6.04	4194	69.91	ECP-2-DWF	400 DI K9	20.00	350 DI K9	25.00	25.00	0.80	0.87
Intermediate	2040	6.62	4597	76.62								
Ultimate	2055	7.20	5000	83.33								

Discharge (1 DWF)

Stage	Year	Discharge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		Pipe size and type	Pumpset Capacity (HP) (Intermedi ate)	Pipe size and type	Pumpset Capacity (HP) (Base year to Intermediate)	Pumpset Capacity (HP) (Inter. To Ultimate)	Inter.	Ult
							Available		Available	Available		
Initial	2025	3.02	2097	34.95	ECP-1-DWF	300 DI K9	10.00	350 DI K9	10.00	10.00	0.40	0.43
Intermediate	2040	3.31	2299	38.31								
Ultimate	2055	3.60	2500	41.67								

PROVIDE PUMPING MAIN OF

350 DI K9 SIZE

RESULTS

Size of main 350 DI K9		
PUMPSETS		
During the period from 2025 to 2040 (considering 15 years as life of pumpset)		
Provide	20 HP x	2 NO.
Provide	5 HP x	1 NO.
Standby	5 HP x	1 NO.
PUMP SET OPERATING PLAN (Tentative)		
Lean period (1 DWF)	5 HP x	2 NO.
Ave, flow (2 DWF)	20 HP x	1 NO.
Ave, flow (2 DWF)	5 HP x	1 NO.
Peak, flow (3 DWF)	20 HP x	2 NO.
Peak, flow (3 DWF)	5 HP x	1 NO.
During the period from 2040 to 2055 (considering 15 years as life of pumpset)		
Provide	25 HP x	2 NO.
Provide	5 HP x	1 NO.
Standby	5 HP x	1 NO.
PUMP SET OPERATING PLAN (Tentative)		
Lean period (1 DWF)	5 HP x	1 NO.
Lean period (1 DWF)	5 HP x	1 NO.
Ave, flow (2 DWF)	25 HP x	1 NO.
Ave, flow (2 DWF)	0 HP x	1 NO.
Peak, flow (3 DWF)	25 HP x	2 NO.
Peak, flow (3 DWF)	5 HP x	1 NO.
For Estimate of pump sets propose (Intermediate)		
20 HP x 2 No. + 5 HP x 1 No. + 5 x 1 No. Standby		

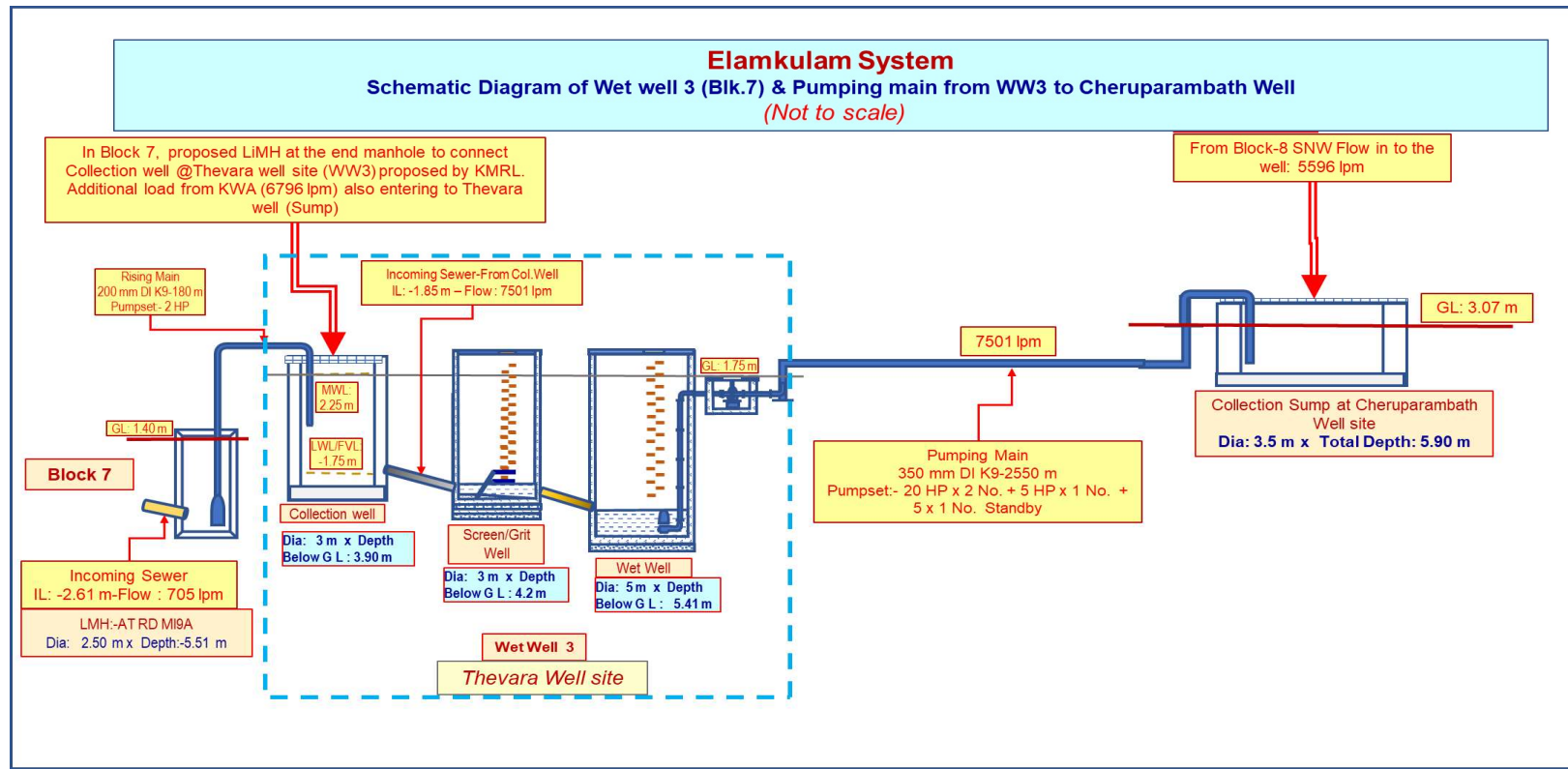
20 HP x 2 No. + 5 HP x 1 No. + 5 x 1 No. Standby

CHECK	
40	45
5	

10	10.00
20	25.00
5	
40	45.00
5	

50	50
5	

5	10.00
5	
25	25.00
0	
50	50.00
5	



ELANKULAM STP-Block 7			
From WW3 (Thevara well-Sump) to Cheruparambath well-Sump			
Design/Input Data			
Sr. No.	Description	Values	Unit
Input values			
1	Average Flow	9.07	MLD
2	Intermediate Flow	9.94	MLD
3	Peak Flow	10.80	MLD
4	GL at Wet Well site	1.75	m
5	FVL at Thevara well sump	-1.05	m
6	Length of Rising Main	2550.00	m
7	Cheruparambath well-Ground level	3.07	
8	Cheruparambath well-Top level	4.07	m
1	Inner Dia of incoming sewer	0.40	
2	d/D	0.75	
3	Depth of flow in sewer at peak flow	0.30	
4	Velocity in sewer at peak design Ultimate flow	1.00	
9	Residual Head	2.00	m
Output values			
1	Average Flow	377.89	m ³ /hr
2	Peak Flow	450.07	m ³ /hr
3	Suction Depth (Thevara well)	5.41	m

ELANKULAM STP-Block 7From WW3 (Thevara well-Sump) to Cheruparambath well-Sump				
Diameter required for Screen/Grit well				
Data				
Average Flow	9.069	MLD		
Peak Design Flow	10.802	MLD		
	0.125	m ³ /s	0.125	
Inner Dia of incoming sewer	0.400	m	OD: 0.20	
d/D	0.750			
Depth of flow in sewer at peak flow	0.300	m	0.2	
Velocity in sewer at peak design Ultimate flow	1.000	m/s		
Drop of screen chamber floor to invert	0.080	m		
G.L of Screen well	1.750	m		
I.L of Screen Well	-1.150	m		
Assumed width of bars	10	mm		
Clear spacing between bars	25	mm		
Design of Bar Rack (Screen)				
Type of Screening		Manual		
Assume Velocity through screen	0.7	m/s	0.7	
Clear area of openings through the rack	0.179	m ²	0.179	
Clear width of openings through the rack	0.595	m	0.893	
Number of clear spacings	24.000			
So number of bars	23.000			
Total width of the Screen	0.800	m		
Projected fixtures width each side	0.150	m		
Total width of the Screen	1.100	m		
Angle of Inclination of Bar	45 °			
→Angle of Inclination should be 75 °-85° in Mechanically Cleaned and 45° in Manually				
Height above G.L	1.000	m		
Total depth of Bar Rack	1.200	m		
Sin 45°	0.707			
Slant height of Screen	1.700	m		
Tan 45°	1.000			
Horizontal length of Screen	1.200			
Length between pipe and screen	0.600	m		
Length between screen and Effluent pipe(To accommodate grit pump & operating platform)	1.500	m		
Total Length of the chamber	3.000	m		
Providing Manual Screen of Size 1.1 m Width X 1.7 m Height				
Providing well internal diameter of Screen/Grit Well 3 m				

Design of Grit Well

Peak Flow	=	7501.000	lpm
Average Flow	=	6298.000	lpm
Ground Level	=	1.750	m
Invert Level of Incoming	=	-1.050	m
Size of Approach Sewer	=	400.00	mm

Diameter required for Screen/Grit well

Volume of grit collection

As per CPHEEO Manual, volume of grit generated is 0.05 to 0.15 cu.m / ML

hence, take maximum, $0.15 = 0.15 \times 1000 \text{ m}^3 / \text{Mm}^3$
 $= 150 \text{ m}^3 / \text{Mm}^3$
 This quantity is for 24 hrs, hence, per hour flow $= 150 / 24$
 $= 6.25 \text{ m}^3 / \text{mm}^3$

The quantity increases 3 to 4 times during peak

Taking average, 3.5 $= 3.5 \times 6.25$
 $= 21.875 \text{ m}^3 / \text{mm}^3$

This quantity lasts for 2 to 3 hours in Morning and evening

Hence, taking the maximum hours of $= 3$

Volume = $3 \times 21.88 = 65.625 \text{ m}^3 / \text{mm}^3$

For 5 hours of normal flow = $= 6.250 \times 5$

$= 31.250 \text{ m}^3 / \text{mm}^3$

Therefore for total / day $= 96.875 \text{ m}^3 / \text{mm}^3$

Volume of grit collected / day $= \frac{7501 \times 60 \times 24}{1000 \times 10^6} = 96.88$

$= 1.046 \text{ cu.m}$

Volume of Storage required $= 1.046 \text{ cu.m}$

Assuming dia of well as $= 3.00 \text{ m}$

Area of well $= 7.069 \text{ sq.m}$

Depth of Storage required $= 0.148 \text{ m}$

Total depth of Bar Rack			$= 1.200$
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Total depth requird. $= 1.348$

Provide a minimum depth of $= 1.35 \text{ Min. 1.20 to accomo}$

Check:

Volume provided $= \frac{2 \times 3 \times 3 \times 1.35 \times 2}{7 \times 4}$

$= 6.370 \text{ cu.m}$

No. of days $= 6.370 / 1.05$

$= 6.088 \text{ days}$

Depth of Grit well

G.L $= 1.750 \text{ m}$

I.L of incoming pipe $= -1.050 \text{ m}$

Depth of storage for grit and accomodation of pump $= 1.350 \text{ m}$

Total depth $= 4.150 \text{ m}$

Provide a Total depth below GL. $= 4.200 \text{ m}$

ELANKULAM STP-Block 7From WW3 (Thevara well-Sump) to Cheruparambath well-Sump				
Design/Input Data				
Wet Well Calculations				
Sr. No.	Description	Unit	Value	Remark
Basic details				
1	Peak Flow	m ³ /hr	450.072	
wet well design				
1	Time for one pump cycle for ultimate design stage	min	15.00	CPHEEP manual part A; 4.6.6
2	wet well capacity required for ultimate design stage	m ³	28.130	
3	Assumed sewage depth in wet well	m	1.500	
4	Area required for wet well	m ²	18.753	
5	Diameter required for wet well	m	4.886	
6	Diameter provided for wet well	m	5.000	
7	Actual provided wet well area	m ²	19.635	
8	Actual provided wet well capacity	m ³	29.452	
9	Ground level at wet well site	m	1.750	
10	Invert level of incoming sewer in wet well	m	-1.160	
11	Difference between MWL in wet well and incoming	m	0.100	
12	Maximum water level in wet well (MWL)	m	-1.260	
13	Lowest water level in wet well (LWL)	m	-2.760	
14	Required pump submergence depth	m	0.900	
15	Wet well bed level	m	-3.660	
wet well dimensions				
1	Total wet well depth	m	5.410	
2	Wet well diameter required	m	5.000	
3	Wet well diameter to be provided	m	5.000	

Valve Chamber		
Length	2.30	m
Breadth	3.80	m
Total Depth	1.90	m
penstock depth-Grit /screen	3.00	m
penstock depth-Suction well	3.00	m
Silt Pit		
Length	1.5	m
Width	1.5	m
Depth	1.2	m

Valve Chamber*			
Dia, mm	L, m	B, m	D, m
100	1.4	3.3	1.4
150	1.5	3.4	1.5
200	1.6	3.5	1.5
250	1.8	3.5	1.6
300	1.9	3.6	1.7
350	2.1	3.7	1.8
400	2.3	3.8	1.9
450	2.4	3.9	2.1
500	2.4	3.9	2.2
600	2.8	4.7	2.4
700	2.9	4.8	2.7
750	2.9	4.8	2.8
800	3	4.9	3
900	3.1	5	3.2
1000	3.2	5.1	3.4

SPS DATA		
Depth of Collection Well	4.90	m
Dia of Collection Well	3.00	m
Pump HP	20.00	HP
RM Delivery Pipe Dia.	400.00	mm
SCREEN WELL DATA		
G.L	1.75	m
I.L of incoming pipe	-1.05	m
Dia of Grit Well	3.00	m
Incoming Pipe Dia. Of Network	400.00	mm
Total width of the Screen	1.20	m
Slant height of Screen	1.70	m
Depth	5.20	m

SOURCE :

wt.of 25x3 mm flat=0.59 kg/m	0.59
wt.of 12x3 mm flat=0.28 kg/m	0.28
wt.of 25x6 mm flat=1.18 kg/m	1.18
wt.of 50x10 mm flat=3.92 kg/m	3.92
wt.of 50x50 x6mm angle=4.47 kg/m	4.47
wt.of 150x75 x10mm angle=16.9 kg/m	16.9
wt.of ISMB 300mm =42.2 kg/m	42.2
wt.of ISMB 400mm =66.3 kg/m	66.3
wt.of ISMB 600mm =122 kg/m	122

Pipe Depth at IntCon.	3.00	m
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Grit Well						
Design of Grit Well						
Depth of Grit Well	5.20	m		Total Depth(m)		6.10
Parapet Height	1.00	m		outer dia (m)		3.9
Total Height of well + Parapet	6.20	m		centre dia(m)		3.45
Dia of Grit Well	3	m		raft dia(m)		3.00
Thickness of wall	0.45	m		Screen Horizontal platform width(m)		1.5
Thickness of Raft Slab	0.45	m		Screen Mesh Opening(m)		0.6
Thickness of Plugging	0.30	m				
Design of kerb						
Diameter of grit well	3.00	m		Extra width for Excavation for working including both sides		1.2
Well wall thickness	0.45	m		Benching depth assumed		0.25
Kerb wall thickness at top	0.53	m				
Kerb wall thickness at bottom	0.15	m				
kerb height outer	1.05	m				
kerb height inner	0.45	m				
kerb height outer excluding inner	0.60	m				
kerb slope	0.71	m				
Thickness of raft	0.45	m				
Thickness of plugging	0.30	m				
Circumference of well kerb (l)	11.07	m				
Volume of Kerb	4.86	cu.m				

Suction Well						
Design Data						
Depth of Suction Well	4.90	m			Screen Mesh Opening for Pump	
Parapet Height	1.00	m			Length(m)	0.8
Total Height of well + Parapet	5.90	m			Breadth(m)	1.5
Dia of Suction Well	3.00	m			Outer Dia (m)	3.9
Thickness of wall	0.45	m			Center Dia (m)	3.45
Thickness of Raft Slab	0.45	m			Raft Dia (m)	3.00
Thickness of Plugging	0.3	m			Total Depth	5.65
Design of kerb						
Diameter of wall	3.00	m				
Well wall thickness	0.45	m				
Kerb wall thickness at top	0.53	m				
Kerb wall thickness at bottom	0.15	m				
kerb height outer	1.05	m				
kerb height inner	0.45	m				
kerb height outer excluding inner	0.60	m				
kerb slope	0.71	m				
Thickness of raft	0.45	m				
Thickness of plugging	0.30	m				
Circumference of well kerb (l)	11.07	m				
Volume of Kerb	1.57	cu.m				

Valve Chamber		
Length	2.30	m
Breadth	3.80	m
Total Depth	1.90	m
penstock depth-Grit /screen	3.00	m
penstock depth-Suction well	3.00	m
Silt Pit		
Length	1.5	m
Width	1.5	m
Depth	1.2	m

Valve Chamber*			
Dia, mm	L, m	B, m	D, m
100	1.4	3.3	1.4
150	1.5	3.4	1.5
200	1.6	3.5	1.5
250	1.8	3.5	1.6
300	1.9	3.6	1.7
350	2.1	3.7	1.8
400	2.3	3.8	1.9
450	2.4	3.9	2.1
500	2.4	3.9	2.2
600	2.8	4.7	2.4
700	2.9	4.8	2.7
750	2.9	4.8	2.8
800	3	4.9	3
900	3.1	5	3.2
1000	3.2	5.1	3.4

SPS DATA		
Depth of Suction Well	5.41	m
Dia of Suction Well	5.00	m
Pump HP	20.00	HP
RM Delivery Pipe Dia.	400.00	mm
SCREEN WELL DATA		
G.L	1.75	m
I.L of incoming pipe	-1.05	m
Dia of Grit Well	3.00	m
Incoming Pipe Dia. Of Network	400.00	mm
Total width of the Screen	1.20	m
Slant height of Screen	1.70	m
Depth	4.20	m

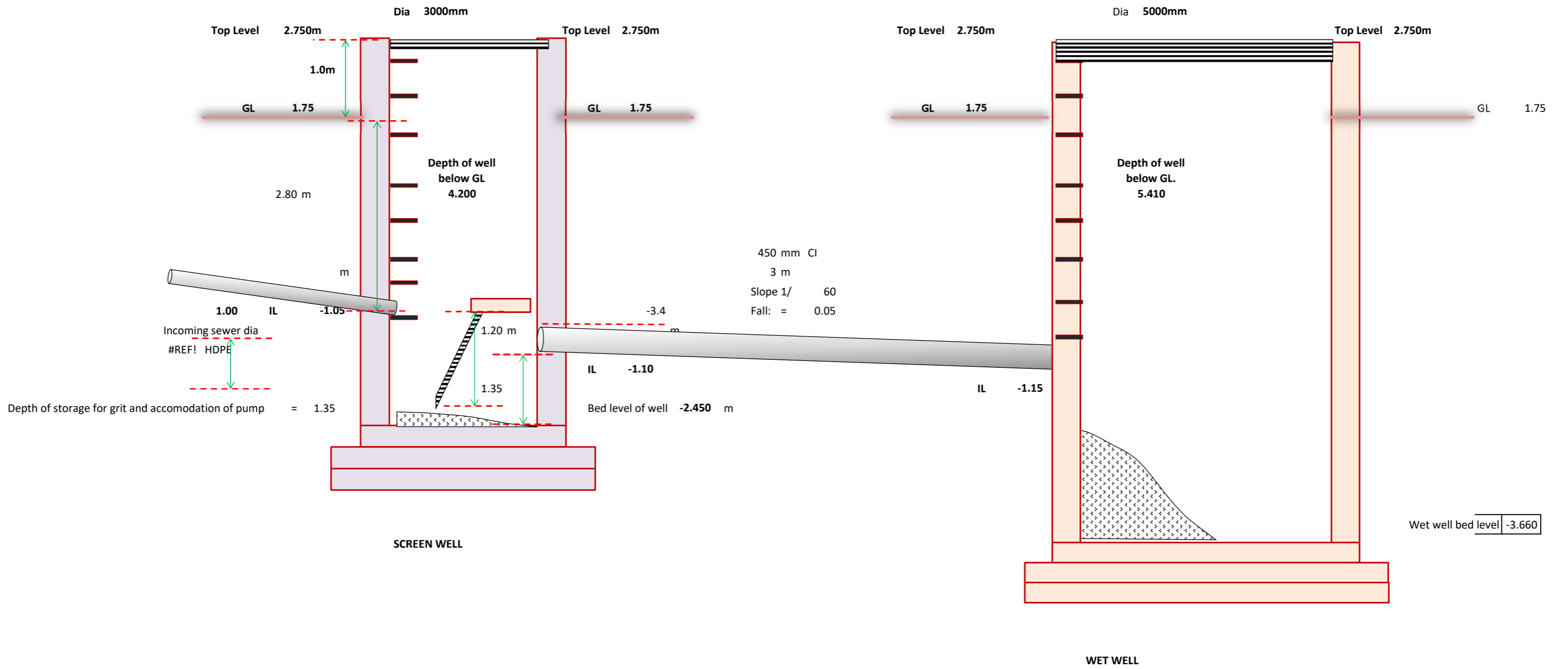
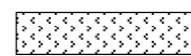
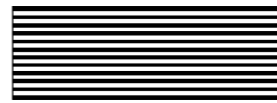
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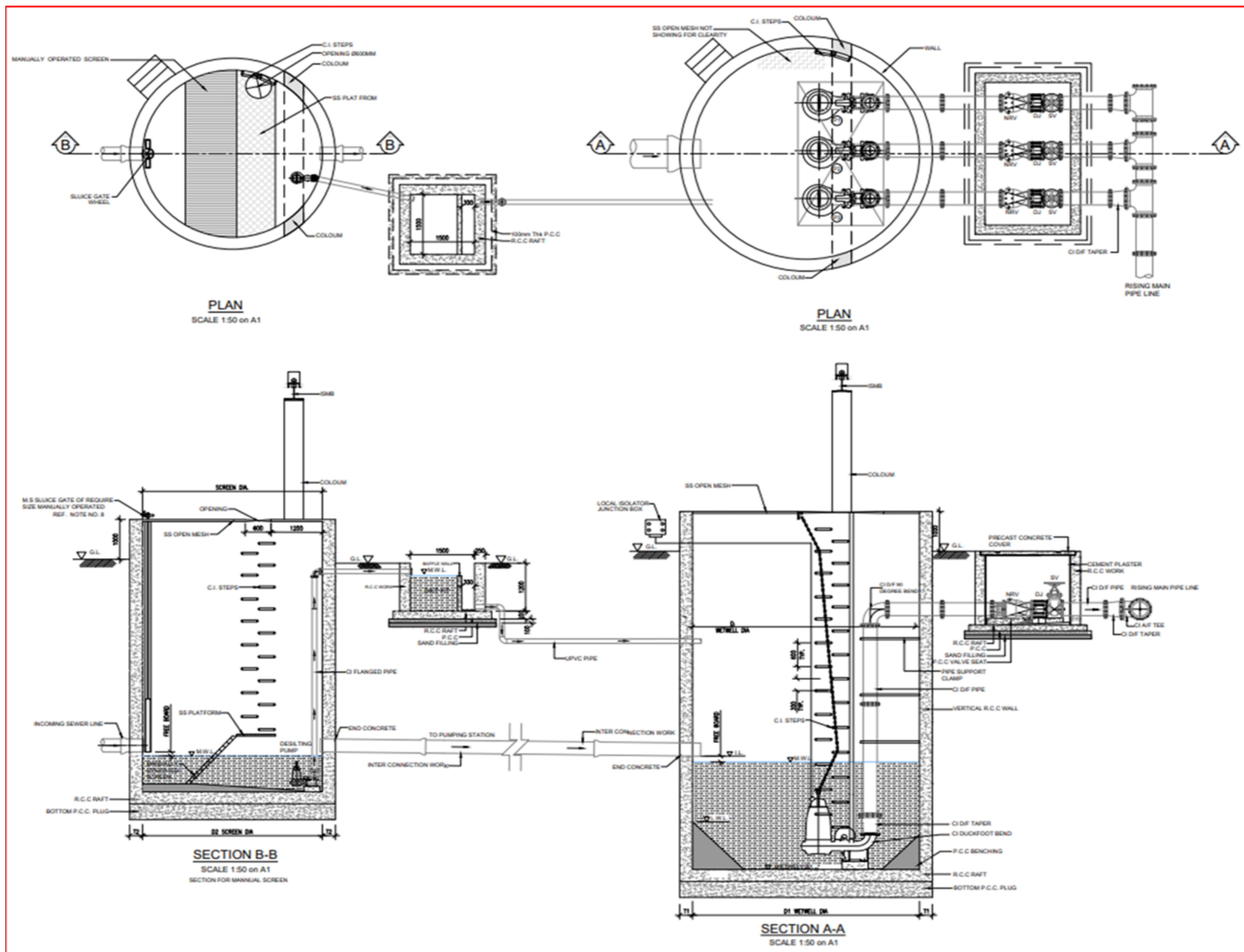
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wt.of 12x3 mm flat=0.28 kg/m	0.28
wt.of 25x6 mm flat=1.18 kg/m	1.18
wt.of 50x10 mm flat=3.92 kg/m	3.92
wt.of 50x50 x6mm angle=4.47 kg/m	4.47
wt.of 150x75 x10mm angle=16.9 kg/m	16.9
wt.of ISMB 300mm =42.2 kg/m	42.2
wt.of ISMB 400mm =66.3 kg/m	66.3
wt.of ISMB 600mm =122 kg/m	122

Pipe Depth at IntCon.	3.00	m
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Grit Well						
Design of Grit Well						
Depth of Grit Well	4.20	m		Total Depth(m)		5.25
Parapet Height	1.00	m		outer dia (m)		3.9
Total Height of well + Parapet	5.20	m		centre dia(m)		3.45
Dia of Grit Well	3	m		raft dia(m)		3.00
Thickness of wall	0.45	m		Screen Horizontal platform width(m)		1.5
Thickness of Raft Slab	0.45	m		Screen Mesh Opening(m)		0.6
Thickness of Plugging	0.30	m				
Design of kerb						
Diameter of grit well	3.00	m		Extra width for Excavation for working including both sides		1.2
Well wall thickness	0.45	m		Benching depth assumed		0.25
Kerb wall thickness at top	0.53	m				
Kerb wall thickness at bottom	0.15	m				
kerb height outer	1.05	m				
kerb height inner	0.45	m				
kerb height outer excluding in	0.60	m				
kerb slope	0.71	m				
Thickness of raft	0.45	m				
Thickness of plugging	0.30	m				
Circumference of well kerb (l)	11.07	m				
Volume of Kerb	4.86	cu.m				

Suction Well						
Design Data						
Depth of Suction Well	5.41	m			Screen Mesh Opening for Pump	
Parapet Height	1.00	m			Length(m)	1.3
Total Height of well + Parapet	6.41	m			Breadth(m)	1.5
Dia of Suction Well	5.00	m			Outer Dia (m)	6.2
Thickness of wall	0.6	m			Center Dia (m)	5.60
Thickness of Raft Slab	0.6	m			Raft Dia (m)	5.00
Thickness of Plugging	0.4	m			Total Depth	6.74
Design of kerb						
Diameter of wall	5.00	m				
Well wall thickness	0.60	m				
Kerb wall thickness at top	0.68	m				
Kerb wall thickness at bottom	0.15	m				
kerb height outer	1.33	m				
kerb height inner	0.60	m				
kerb height outer excluding in	0.73	m				
kerb slope	0.90	m				
Thickness of raft	0.60	m				
Thickness of plugging	0.40	m				
Circumference of well kerb (l)	17.83	m				
Volume of Kerb	3.91	cu.m				





DESIGN OF PUMPING MAIN

BASIC DATA		
GL AT Wet well site	1.750	m
Top level of receiving chamber	4.070	m
Residual Head	2.000	m
TOTAL HGL REQUIRED AT END	4.070	m
FOOT VALVE LEVEL	-3.660	m
Static head including Residual Head	9.730	m
Number of reaches	1	
Length	2550	m

Combination	Pipes selected
I	200 DI K9
II	250 DI K9
III	300 DI K9
IV	350 DI K9
V	400 DI K9

INTERMEDIATE STAGE
TABLE1. FRICTION LOSS

Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Vclcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	1.75											153.70	151.95	AT WET WELL
0	2550	4.07	2550	200	DI-K9	140	6903	3.662	19	134.21	13.42	147.63	6.07	2.00	AT STP SITE
									TOTAL	134.21	13.42	147.63			
Combination II															
	0	1.75											55.28	53.53	AT WET WELL
0	2550	4.07	2550	250	DI-K9	140	6903	2.344	57	44.74	4.47	49.21	6.07	2.00	AT STP SITE
									TOTAL	44.74	4.47	49.21			
Combination III															
	0	1.75											26.40	24.65	AT WET WELL
0	2550	4.07	2550	300	DI-K9	140	6903	1.628	138	18.48	1.85	20.33	6.07	2.00	AT STP SITE
									TOTAL	18.48	1.85	20.33			
Combination IV															
	0	1.75											15.67	13.92	AT WET WELL
0	2550	4.07	2550	350	DI-K9	140	6903	1.196	292	8.73	0.87	9.60	6.07	2.00	AT STP SITE
									TOTAL	8.73	0.87	9.60			
Combination V															
	0	1.75											11.09	9.34	AT WET WELL
0	2550	4.07	2550	400	DI-K9	140	6903	0.916	559	4.56	0.46	5.02	6.07	2.00	AT STP SITE
									TOTAL	4.56	0.46	5.02			

ULTIMATE STAGE																
TABLE1. FRICTION LOSS																
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Vclcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS	
Start	End			Size in mm	Type & Class	C' value										
Combination I																
	0	1.75											181.39	179.64	AT WET WELL	
0	2550	4.07	2550	200	DI-K9	140	7501	3.98	16	159.38	15.94	175.32	6.07	2.00	AT STP SITE	
									TOTAL	159.38	15.94	175.32				
Combination II																
	0	1.75											63.31	61.56	AT WET WELL	
0	2550	4.07	2550	250	DI-K9	140	7501	2.547	49	52.04	5.20	57.24	6.07	2.00	AT STP SITE	
									TOTAL	52.04	5.20	57.24				
Combination III																
	0	1.75											29.84	28.09	AT WET WELL	
0	2550	4.07	2550	300	DI-K9	140	7501	1.769	118	21.61	2.16	23.77	6.07	2.00	AT STP SITE	
									TOTAL	21.61	2.16	23.77				
Combination IV																
	0	1.75											17.29	15.54	AT WET WELL	
0	2550	4.07	2550	350	DI-K9	140	7501	1.299	250	10.2	1.02	11.22	6.07	2.00	AT STP SITE	
									TOTAL	10.2	1.02	11.22				
Combination V																
	0	1.75											11.92	10.17	AT WET WELL	
0	2550	4.07	2550	400	DI-K9	140	7501	0.995	479	5.32	0.53	5.85	6.07	2.00	AT STP SITE	
									TOTAL	5.32	0.53	5.85				

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	9.73	134.21	13.421	157.36	159.4	15.94	185.05
II	9.73	44.74	4.474	58.94	52.04	5.204	66.97
III	9.73	18.48	1.848	30.06	21.61	2.161	33.50
IV	9.73	8.73	0.873	19.33	10.2	1.02	20.95
V	9.73	4.56	0.456	14.75	5.32	0.532	15.58

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	6903	157	340	345	7501	185	435	435
II	6903	59	127	130	7501	67	157	160
III	6903	30	65	65	7501	34	79	80
IV	6903	19	42	45	7501	21	49	50
V	6903	15	32	35	7501	16	37	40

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	345	50000	17250000	435	50000	21750000	5206777	22456777
II	130	50000	6500000	160	50000	8000000	1915136	8415136
III	65	46000	2990000	80	46000	3680000	880963	3870963
IV	45	47000	2115000	50	47000	2350000	562571	2677571
V	35	50000	1750000	40	47000	1880000	450057	2200057

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		10							
Comb inatio	Intermediate Stage				Ultimate Stage					Total cost				
	BHP	Units	Cost	Capitalised	BHP	Units	Cost	Capitalised cost	Equ.cost					
I	340	2222082	22220820	202855760	435	2839571	28395710	259226858	62056849	264912609				
II	127	832358	8323580	75986672	157	1027688	10276880	93818514	22459406	98446078				
III	65	424446	4244460	38748037	79	514105	5141050	46933084	11235407	49983444				
IV	42	272965	2729650	24919208	49	321455	3214550	29345901	7025175	31944383				
V	32	208204	2082040	19007121	37	239114	2391140	21828921	5225670	24232791				

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	200 DI K9	2550	2507	6392850
		TOTAL		6392850
II	250 DI K9	2550	3367	8585850
		TOTAL		8585850
III	300 DI K9	2550	4251	10840050
		TOTAL		10840050
IV	350 DI K9	2550	5188	13229400
		TOTAL		13229400
V	400 DI K9	2550	6226	15876300
		TOTAL		15876300

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	6392850	22456777	28849627
II	8585850	8415136	17000986
III	10840050	3870963	14711013
IV	13229400	2677571	15906971
V	15876300	2200057	18076357

TABLE 8. Cost of installation and maintenance

Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size	Inter.	Ult.
					Pump set	Pump set Cap.
1	2	3	4. (2 + 3)	5.	6.	7.
I	28849627	264912609	293762236	200 DI K9	345	435
II	17000986	98446078	115447064	250 DI	130	160
III	14711013	49983444	64694457	300 DI K9	65	80
IV	15906971	31944383	47851354	350 DI K9	45	50
V	18076357	24232791	42309148	400 DI	35	40

Hence Combination V consisting of 400 DI K9 2550 m x 35 HP is found to be economical

BASIC DATA		
GL AT Wet well site	1.750	m
Top level of receiving chamber	4.070	m
Residual Head	2.000	m
TOTAL HGL REQUIRED AT END	4.070	m
FOOT VALVE LEVEL	-3.660	m
Static head including Residual Head	9.730	m
Number of reaches	1	
Length	2550	m

Combination	Pipes selected
I	200 DI K9
II	250 DI K9
III	300 DI K9
IV	350 DI K9
V	400 DI K9

INTERMEDIATE STAGE																
TABLE1. FRICTION LOSS																
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velocity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS	
Start	End			Size in mm	Type & Class	C' value										
Combination I																
	0	1.75											74.49	72.74	AT WET WELL	
0	2550	4.07	2550	200	DI-K9	140	4597	2.439	41	62.2	6.22	68.42	6.07	2.00	AT STP SITE	
									TOTAL	62.2	6.22	68.42				
Combination II																
	0	1.75											29.45	27.70	AT WET WELL	
0	2550	4.07	2550	250	DI-K9	140	4597	1.561	120	21.25	2.13	23.38	6.07	2.00	AT STP SITE	
									TOTAL	21.25	2.13	23.38				
Combination III																
	0	1.75											15.67	13.92	AT WET WELL	
0	2550	4.07	2550	300	DI-K9	140	4597	1.084	292	8.73	0.87	9.60	6.07	2.00	AT STP SITE	
									TOTAL	8.73	0.87	9.60				
Combination IV																
	0	1.75											10.60	8.85	AT WET WELL	
0	2550	4.07	2550	350	DI-K9	140	4597	0.796	619	4.12	0.41	4.53	6.07	2.00	AT STP SITE	
									TOTAL	4.12	0.41	4.53				
Combination V																
	0	1.75											8.44	6.69	AT WET WELL	
0	2550	4.07	2550	400	DI-K9	140	4597	0.61	1187	2.15	0.22	2.37	6.07	2.00	AT STP SITE	
									TOTAL	2.15	0.22	2.37				

ULTIMATE STAGE																
TABLE1. FRICTION LOSS																
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Vелcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS	
Start	End			Size in mm	Type & Class	C' value										
Combination I																
	0	1.75											86.22	84.47	AT WET WELL	
0	2550	4.07	2550	200	DI-K9	140	5000	2.653	35	72.86	7.29	80.15	6.07	2.00	AT STP SITE	
									TOTAL	72.86	7.29	80.15				
Combination II																
	0	1.75											33.31	31.56	AT WET WELL	
0	2550	4.07	2550	250	DI-K9	140	5000	1.698	103	24.76	2.48	27.24	6.07	2.00	AT STP SITE	
									TOTAL	24.76	2.48	27.24				
Combination III																
	0	1.75											17.29	15.54	AT WET WELL	
0	2550	4.07	2550	300	DI-K9	140	5000	1.179	250	10.2	1.02	11.22	6.07	2.00	AT STP SITE	
									TOTAL	10.2	1.02	11.22				
Combination IV																
	0	1.75											11.36	9.61	AT WET WELL	
0	2550	4.07	2550	350	DI-K9	140	5000	0.866	530	4.81	0.48	5.29	6.07	2.00	AT STP SITE	
									TOTAL	4.81	0.48	5.29				
Combination V																
	0	1.75											8.83	7.08	AT WET WELL	
0	2550	4.07	2550	400	DI-K9	140	5000	0.663	1016	2.51	0.25	2.76	6.07	2.00	AT STP SITE	
									TOTAL	2.51	0.25	2.76				

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	9.73	62.2	6.22	78.15	72.86	7.286	89.88
II	9.73	21.25	2.125	33.11	24.76	2.476	36.97
III	9.73	8.73	0.873	19.33	10.2	1.02	20.95
IV	9.73	4.12	0.412	14.26	4.81	0.481	15.02
V	9.73	2.15	0.215	12.10	2.51	0.251	12.49

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	4597	78	112	115	5000	90	141	145
II	4597	33	48	50	5000	37	58	60
III	4597	19	28	30	5000	21	33	35
IV	4597	14	21	25	5000	15	24	25
V	4597	12	17	20	5000	12	20	20

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	115	50000	5750000	145	50000	7250000	1735592	7485592
II	50	47000	2350000	60	46000	2760000	660722	3010722
III	30	50000	1500000	35	50000	1750000	418936	1918936
IV	25	50000	1250000	25	50000	1250000	299240	1549240
V	20	50000	1000000	20	50000	1000000	239392	1239392

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		10							
Combination	Intermediate Stage				Ultimate Stage					Total cost				
	BHP	Units	Cost	Capitalised	BHP	Units	Cost	Capitalised cost	Equ.cost					
I	112	734987	7349870	67097590	141	919273	9192730	83921216	20090072	87187662				
II	48	311325	3113250	28421125	58	378113	3781130	34518258	8263397	36684521				
III	28	181803	1818030	16596951	33	214281	2142810	19561895	4682962	21279913				
IV	21	134097	1340970	12241829	24	153637	1536370	14025653	3357630	15599459				
V	17	113774	1137740	10386525	20	127758	1277580	11663137	2792062	13178588				

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	200 DI K9	2550	2507	6392850
		TOTAL		6392850
II	250 DI K9	2550	3367	8585850
		TOTAL		8585850
III	300 DI K9	2550	4251	10840050
		TOTAL		10840050
IV	350 DI K9	2550	5188	13229400
		TOTAL		13229400
V	400 DI K9	2550	6226	15876300
		TOTAL		15876300

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	6392850	7485592	13878442
II	8585850	3010722	11596572
III	10840050	1918936	12758986
IV	13229400	1549240	14778640
V	15876300	1239392	17115692

TABLE 8. Cost of installation and maintenance

Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	2	3	4. (2 + 3)	5.	6.	7.
I	13878442	87187662	101066104	200 DI K9	115	145
II	11596572	36684521	48281093	250 DI K9	50	60
III	12758986	21279913	34038899	300 DI K9	30	35
IV	14778640	15599459	30378099	350 DI K9	25	25
V	17115692	13178588	30294280	400 DI K9	20	20

Hence Combination V
consisting of 400 DI K9 2550 m x 20 HP
is found to be economical

BASIC DATA		
GL AT Wet well site	1.75	m
Top level of receiving chamber	4.07	m
Residual Head	2.00	m
TOTAL HGL REQUIRED AT END	4.07	m
FOOT VALVE LEVEL	-3.66	m
Static head including Residual Head	9.73	m
Number of reaches	1	
Length	2550	m

Combination	Pipes selected
I	200 DI K9
II	250 DI K9
III	300 DI K9
IV	350 DI K9
V	400 DI K9

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Vclcity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	1.75											25.29	23.54	AT WET WELL
0	2550	4.07	2550	200	DI-K9	140	2299	1.219	146	17.47	1.75	19.22	6.07	2.00	AT STP SITE
									TOTAL	17.47	1.75	19.22			
Combination II															
	0	1.75											12.54	10.79	AT WET WELL
0	2550	4.07	2550	250	DI-K9	140	2299	0.78	434	5.88	0.59	6.47	6.07	2.00	AT STP SITE
									TOTAL	5.88	0.59	6.47			
Combination III															
	0	1.75											8.73	6.98	AT WET WELL
0	2550	4.07	2550	300	DI-K9	140	2299	0.542	1055	2.42	0.24	2.66	6.07	2.00	AT STP SITE
									TOTAL	2.42	0.24	2.66			
Combination IV															
	0	1.75											7.32	5.57	AT WET WELL
0	2550	4.07	2550	350	DI-K9	140	2299	0.398	2236	1.14	0.11	1.25	6.07	2.00	AT STP SITE
									TOTAL	1.14	0.11	1.25			
Combination V															
	0	1.75											6.73	4.98	AT WET WELL
0	2550	4.07	2550	400	DI-K9	140	2299	0.305	4284	0.6	0.06	0.66	6.07	2.00	AT STP SITE
									TOTAL	0.6	0.06	0.66			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velocity-mps	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	1.75											28.51	26.76	AT WET WELL
0	2550	4.07	2550	200	DI-K9	140	2500	1.326	125	20.4	2.04	22.44	6.07	2.00	AT STP SITE
									TOTAL	20.4	2.04	22.44			
Combination II															
	0	1.75											13.61	11.86	AT WET WELL
0	2550	4.07	2550	250	DI-K9	140	2500	0.849	372	6.85	0.69	7.54	6.07	2.00	AT STP SITE
									TOTAL	6.85	0.69	7.54			
Combination III															
	0	1.75											9.17	7.42	AT WET WELL
0	2550	4.07	2550	300	DI-K9	140	2500	0.589	903	2.82	0.28	3.10	6.07	2.00	AT STP SITE
									TOTAL	2.82	0.28	3.10			
Combination IV															
	0	1.75											7.53	5.78	AT WET WELL
0	2550	4.07	2550	350	DI-K9	140	2500	0.433	1914	1.33	0.13	1.46	6.07	2.00	AT STP SITE
									TOTAL	1.33	0.13	1.46			
Combination V															
	0	1.75											6.84	5.09	AT WET WELL
0	2550	4.07	2550	400	DI-K9	140	2500	0.332	3667	0.7	0.07	0.77	6.07	2.00	AT STP SITE
									TOTAL	0.7	0.07	0.77			

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	9.73	17.47	1.747	28.95	20.4	2.04	32.17
II	9.73	5.88	0.588	16.20	6.85	0.685	17.27
III	9.73	2.42	0.242	12.39	2.82	0.282	12.83
IV	9.73	1.14	0.114	10.98	1.33	0.133	11.19
V	9.73	0.6	0.06	10.39	0.7	0.07	10.50

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	2299	29	21	25	2500	32	25	30
II	2299	16	12	15	2500	17	14	15
III	2299	12	9	10	2500	13	10	15
IV	2299	11	8	10	2500	11	9	10
V	2299	10	7	10	2500	11	8	10

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	25	50000	1250000	30	50000	1500000	359088	1609088
II	15	58000	870000	15	58000	870000	208271	1078271
III	10	63000	630000	15	58000	870000	208271	838271
IV	10	63000	630000	10	63000	630000	150817	780817
V	10	63000	630000	10	63000	630000	150817	780817

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE	10							
Combination	Intermediate Stage				Ultimate Stage					Total cost			
	BHP	Units	Cost	Capitalised	BHP	Units	Cost	Capitalised cost	Equ.cost				
I	21	136123	1361230	12426785	25	164550	1645500	15021910	3596126	16022911			
II	12	76198	761980	6956180	14	88287	882870	8059796	1929451	8885631			
III	9	58292	582920	5321526	10	65611	656110	5989684	1433883	6755409			
IV	8	51626	516260	4712982	9	57246	572460	5226036	1251072	5964053			
V	7	48882	488820	4462479	8	53717	537170	4903871	1173948	5636427			

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/ m	Total cost
I	200 DI K9	2550	2507	6392850
		TOTAL		6392850
II	250 DI K9	2550	3367	8585850
		TOTAL		8585850
III	300 DI K9	2550	4251	10840050
		TOTAL		10840050
IV	350 DI K9	2550	5188	13229400
		TOTAL		13229400
V	400 DI K9	2550	6226	15876300
		TOTAL		15876300

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	6392850	1609088	8001938
II	8585850	1078271	9664121
III	10840050	838271	11678321
IV	13229400	780817	14010217
V	15876300	780817	16657117

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	2	3	4. (2 + 3)	5.	6.	7.
I	8001938	16022911	24024849	200 DI K9	25	30
II	9664121	8885631	18549752	250 DI K9	15	15
III	11678321	6755409	18433730	300 DI	10	15
IV	14010217	5964053	19974270	350 DI K9	10	10
V	16657117	5636427	22293544	400 DI K9	10	10

Hence Combination III consisting of 300 DI K9 2550 m x 10 HP is found to be economical

D ESIGN OF SEWAGE WET WELLS, PUMPING MAIN & PUMP SETS
ELAMKULAM STP-From WW4 (Blk.5) to IC@STP

Note:

(ref: CPHEEO Manual-4.20-Sewage pumping main are designed water pumping mains. The exception being that the design practice of economical size of pumping mains in conjunction with the electrical energy of the pump sets as used in water pumping mains is not applicable in sewage pumping mains. This is due to varying rates of discharge through the 24 hours like low, average and peak flows through the same main at various parts of the day and night.

During execution the total head for pumpsets should be calculated considering the wastage due to valves and specials actually used.

In the design 10% of the friction loss is included as minor loss to take care of this.

Basic Data

Wet Well Location and other D etail:

Block No.	TM ends at	IL at the end of TM as per SNW D esign	Ult.Peak Flow as per SNW D esign. (lps)	Pumping main					
				From	To	Length m	Flow ult.peak flow (3 D WF)	GL	
								From	To
12A	WW1	-0.83	80.15	WW1	WW2	2030	80.15	2.44	1.59
12B	WW2	-2.16	78.311	WW2	IC@STP	3500	158.461	1.59	1.98
6	WW5 @STP	-2.1	21.534	WW5	IC@STP	30	21.534	1.98	1.98
5	WW4	-3.19	169.023	WW4	IC@STP	300	169.023	1.65	1.98

Pumping main from WW5 toIC@STP

Ultimate peak flow **169.02 lps**

Flow in MLD

Stage	Year	Flow in MLD
Initial	2025	12.26
Intermediate	2040	13.43
Ultimate	2055	14.60

Length of Pumping Main	300.00 m
Top level of Inlet chamber	7.98 m
Hours of pumping	24.00 hrs
Residual Head	2.00 m
FOOT VALVE LEVEL	-5.80 m
Static head including Residual Head	15.78 m

RESULTS

SEWAGE QUANTITY

D ischarge (3 D WI

Stage	Year	D ischarge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		Pipe size and type	Pumpset Capacity (H P) (Intermediate)	Pipe size and type	Pumpset Capacity (H P) (Base year to Intermediat e)	Pumpset Capacity (H P) (Inter. To Ultimate)	Inter.	Ult
							Available		Available	Available		
Initial	2025	12.26	8514	141.90	ECP-3-DWF	450 D I K9	50.00	350 D I K9	55.00	60.00	1.62	1.76
Intermediate	2040	13.43	9326	155.44								
Ultimate	2055	14.60	10139	168.98								

D ischarge (2 D WI

Stage	Year	D ischarge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		Pipe size and type	Pumpset Capacity (H P) (Intermediate)	Pipe size and type	Pumpset Capacity (H P) (Base year to Intermediate)	Pumpset Capacity (H P) (Inter. To Ultimate)	Inter.	Ult
							Available		Available	Available		
Initial	2025	8.18	5681	94.68	ECP-2-DWF	400 D I K9	35.00	350 D I K9	35.00	40.00	1.08	1.17
Intermediate	2040	8.96	6222	103.70								
Ultimate	2055	9.74	6764	112.73								

D ischarge (1 D WI

Stage	Year	D ischarge			Reference to ECP sheet	ECP design output		Proposed Combination			Velocity	
		MLD	lpm	lps		Pipe size and type	Pumpset Capacity (H P) (Intermediate)	Pipe size and type	Pumpset Capacity (H P) (Base year to Intermediat e)	Pumpset Capacity (H P) (Inter. To Ultimate)	Inter.	Ult
							Available		Available	Available		
Initial	2025	4.09	2840	47.34	ECP-1-DWF	300 D I K9	20.00	350 D I K9	20.00	20.00	0.54	0.59
Intermediate	2040	4.48	3111	51.85								
Ultimate	2055	4.87	3382	56.37								

PROVIDE PUMPING MAIN OF 350 D I K9 SIZE

RESULTS

Size of main 350 D I K'					
PUMPSETS					
During the period from 2025 to 2040 (considering 15 years as life of pumpset			CHECK		
Provide	20 HP x	2 NO.	40	55	
Provide	15 HP x	1 NO.	15		
Standby	5 HP x	1 NO.			
PUMP SET OPERATING PLAN (Tentative)					
Lean period (1 D'	15 HP x	1 NO.	15	20.00	
Lean period (1 D'	5 HP x	1 NO.	5		
Ave, flow (2 DWf	20 HP x	1 NO.	20	35.00	
+	15 HP x	1 NO.	15		
Peak, flow (3 DW	20 HP x	2 NO.	40	55.00	
+	15 HP x	1 NO.	15		

During the period from 2040 to 2055 (considering 15 years as life of pumpset)

Provide 20 HP x 3 NO.

Standby 20 HP x 1 NO.

PUMP SET OPERATING PLAN (Tentative)

Lean period (1 D' 20 HP x 1 NO.

Lean period (1 D' 0 HP x 1 NO.

Ave, flow (2 DWf 20 HP x 2 NO.

+ HP x 1 NO.

Peak, flow (3 DW 20 HP x 3 NO.

Peak, flow (3 DW 0 HP x 1 NO.

For Estimate of pump sets propose (Intermediate)

20 H P x 2 No. + 15 H P x 1 No. + 5 H P x 1 No. Standl

60	60
20	

20 20.00

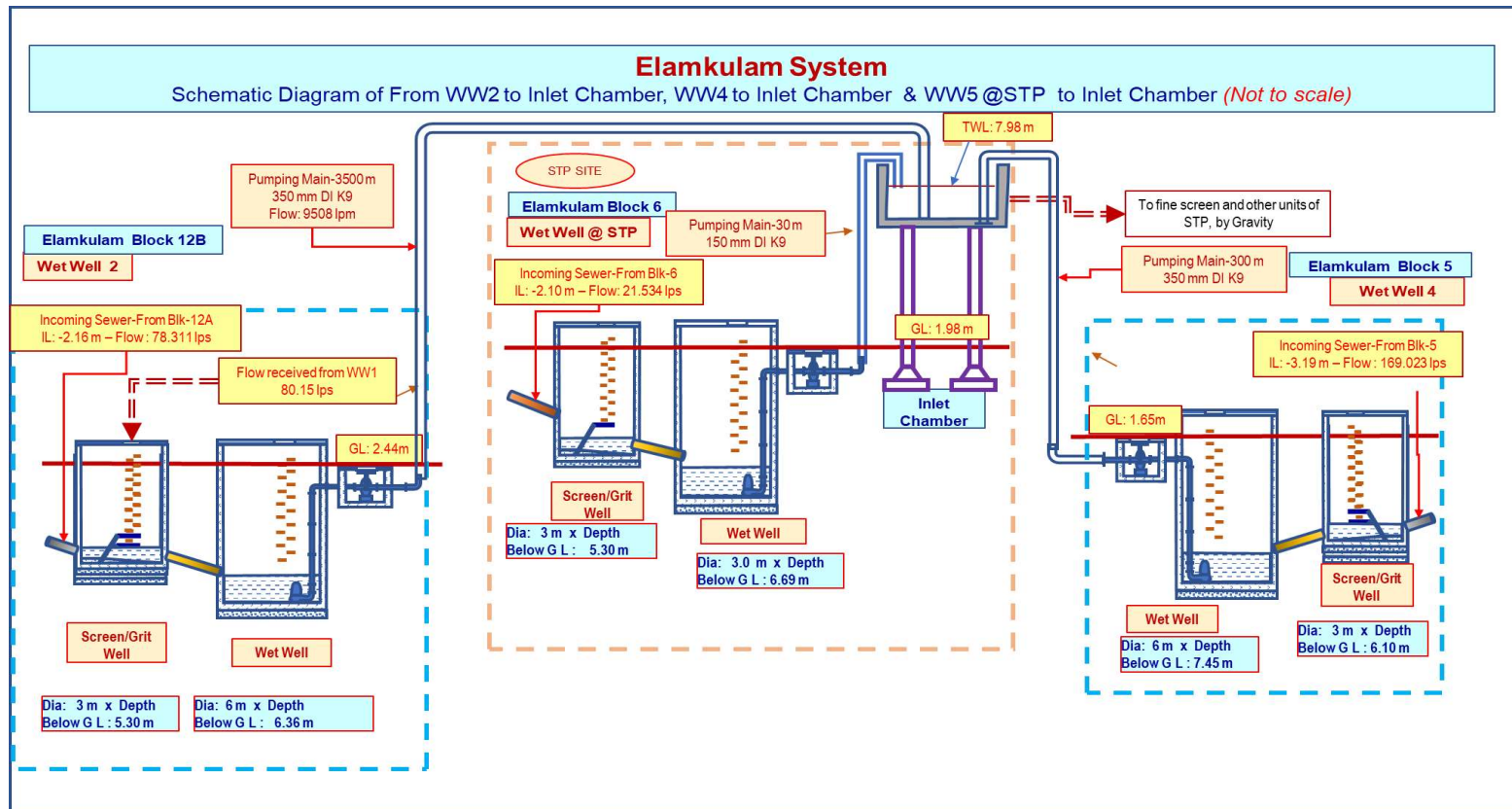
0

40 40.00

0

60 60.00

0



ELAMKULAM STP-From WW4 (Blk.5) to IC@STP			
Design/Input Data			
Sr. No.	Description	Values	Unit
Input values			
1	Average Flow	12.26	MLD
2	Intermediate Flow	13.43	MLD
3	Peak Flow	14.60	MLD
4	G L at WW4 site	1.65	m
5	IL of Incoming Sewer	-3.19	m
6	Length of Rising Main	300.00	m
7	TWL of Inlet chamber at STP	7.98	m
8	Dia of incoming sewer	0.20	m
9	d/D of incoming sewer	0.62	
10	Velocity in sewer at peak design Ultimate flow	0.78	m/s
11	Residual Head	2.00	m
Output values			
1	Average Flow	510.83	m ³ /hr
2	Peak Flow	608.33	m ³ /hr
3	Suction Depth (Depth of SPS)	7.45	m

ELAMKULAM STP-From WW4 (Blk.5) to IC@STP			
Diameter required for Screen/Grit well			
Data			
Average Flow	12.260	MLD	
Peak Design Flow	14.600	MLD	
	0.169	m ³ /s	0.169
Inner Dia of incoming sewer	0.200	m	OD: 0.10
d/D	0.620		
Depth of flow in sewer at peak flow	0.124	m	0.2
Velocity in sewer at peak design Ultimate flow	0.780	m/s	
Drop of screen chamber floor to invert	0.080	m	
G .L of Screen well	1.650	m	
I.L of Screen Well	-3.190	m	
Assumed width of bars	10	mm	
Clear spacing between bars	25	mm	
Design of Bar Rack (Screen)			
Type of Screening		Manual	
Assume Velocity through screen	0.7	m/s	0.7
Clear area of openings through the rack	0.241	m ²	0.241
Clear width of openings through the rack	1.947	m	1.207
Number of clear spacings	78.000		
So number of bars	77.000		
Total width of the Screen	2.700	m	
Projected fixtures width each side	0.150	m	
Total width of the Screen	3.000	m	
Angle of Inclination of Bar	45 °		
→Angle of Inclination should be 75 °-85° in Mechanically Cleaned and 45° in Manually			
Height above G .L	1.000	m	
Total depth of Bar Rack	1.000	m	
Sin 45°	0.707		
Slant height of Screen	1.500	m	
Tan 45°	1.000		
Horizontal length of Screen	1.000		
Length between pipe and screen	0.600	m	
Length between screen and Effluent pipe(To accommodate grit pump & operating platform)	1.500	m	
Total Length of the chamber	3.000	m	
Providing Manual Screen of Size 3 m Width X 1.5 m Height			
Providing well internal diameter of Screen/Grit Well 3 m			

Design of Grit Well

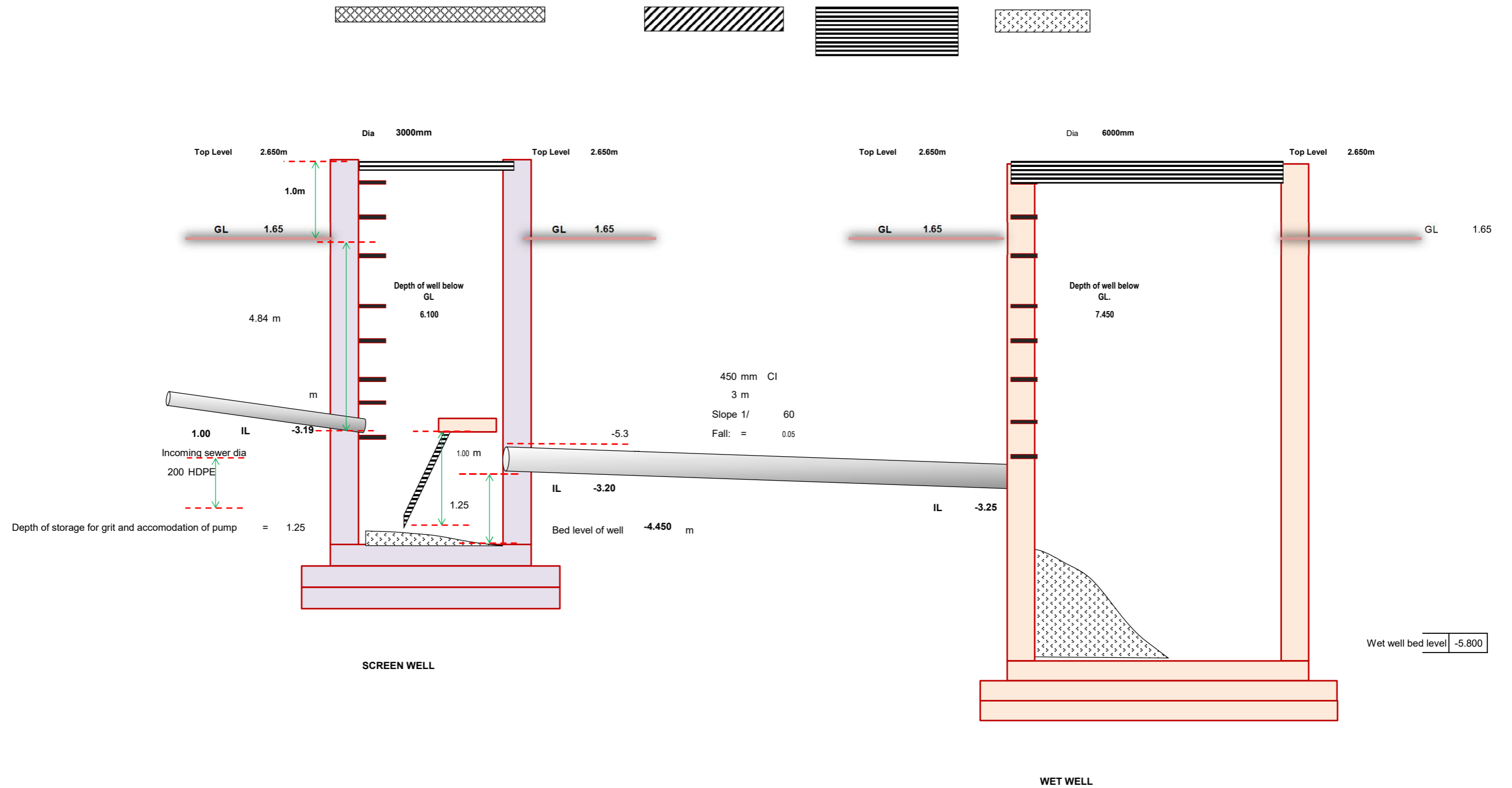
Peak Flow	=	10139.000	lpm
Average Flow	=	8514.000	lpm
G round Leve	=	1.650	m
Invert Level of Incoming	=	-3.190	m
Size of Approach Sewer	=	200.000	mm

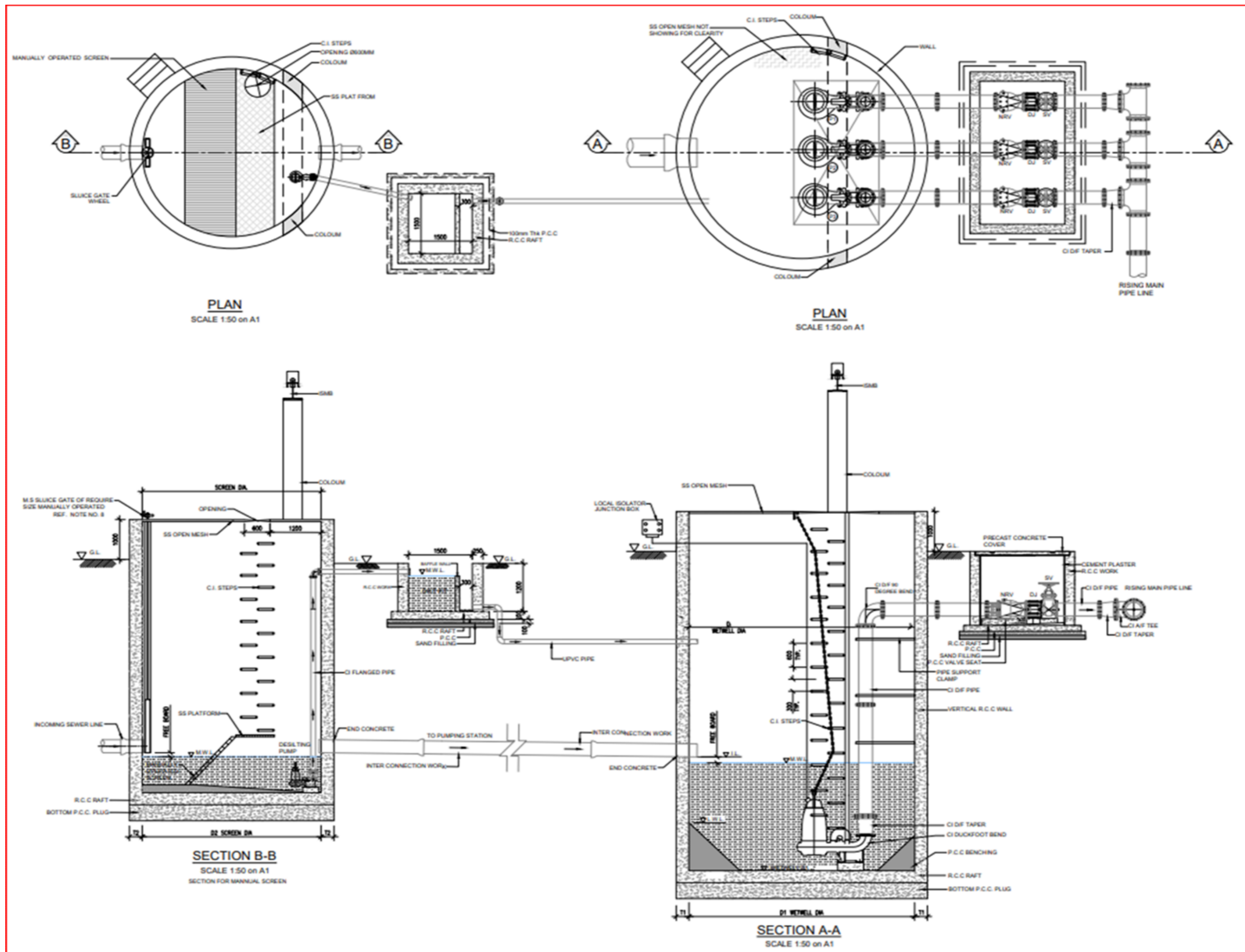
Volume of grit collection

As per CPHEEO Manual, volume of grit generated is 0.05 to 0.15 cu.m / ML

Diameter required for Screen/Grit well			
hence, take maximum,	0.15	=	$0.15 \times 1000 \text{ m}^3 / \text{Mm}^3$
		=	150 m^3 / Mm^3
This quantity is for 24 hrs, hence, per hour flow		=	$150 / 24$
		=	6.25 m^3 / mm^3
The quantity increases 3 to 4 times during peak		=	3.5×6.25
Taking average, 3.5		=	21.875 m^3 / mm^3
This quantity lasts for 2 to 3 hours in Morning and evening		=	3
Hence, taking the maximum hours of		=	65.625 m^3 / mm^3
Volume = 3 x 21.88		=	6.250 x 5
For 5 hours of normal flow =		=	31.250 m^3 / mm^3
Therefore for total / day		=	96.875 m^3 / mm^3
Volume of grit collected / day		=	$\frac{10139 \times 60 \times 24}{1000} \times \frac{96.88}{10^6}$
		=	1.414 cu.m
Volume of Storage required		=	1.414 cu.m
Assuming dia of well as		=	3.00 m
Area of well		=	7.069 sq.m
Depth of Storage required		=	0.200 m
Total depth of Bar Rack		=	1.000
Total depth required.		=	1.200
Provide a minimum depth of		=	1.25 Min. 1.20 to accomo
Check:			
Volume provided		=	$\frac{2 \times 3 \times 3 \times 1.25 \times 2}{7 \times 4}$
		=	5.900 cu.m
No. of days		=	$\frac{5.900}{1.41}$
		=	4.171 days
Depth of Grit well			
G .L		=	1.650 m
I.L of incoming pipe		=	-3.190 m
Depth of storage for grit and accomodation of pump		=	1.250 m
Total depth		=	6.090 m
Provide a Total depth below G L		=	6.100 m

ELAMKULAM STP-From WW4 (Blk.5) to IC@STP				
Design/Input Data				
Wet Well Calculations				
Sr. No.	Description	Unit	Value	Remark
Basic details				
1	Peak Flow	m ³ /hr	608.333	
wet well design				
1	Time for one pump cycle for ultimate design stage	min	15.00	CPHEEP manual part A; 4.6.6
2	wet well capacity required for ultimate design stage	m ³	38.021	
3	Assumed sewage depth in wet well	m	1.500	
4	Area required for wet well	m ²	25.347	
5	Diameter required for wet well	m	5.681	
6	Diameter provided for wet well	m	6.000	
7	Actual provided wet well area	m ²	28.274	
8	Actual provided wet well capacity	m ³	42.412	
9	Ground level at wet well site	m	1.650	
10	Invert level of incoming sewer in wet well	m	-3.300	
11	Difference between MWL in wet well and incoming	m	0.100	
12	Maximum water level in wet well (MWL)	m	-3.400	
13	Lowest water level in wet well (LWL)	m	-4.900	
14	Required pump submergence depth	m	0.900	
15	Wet well bed level	m	-5.800	
wet well dimensions				
1	Total wet well depth	m	7.450	
2	Wet well diameter required	m	6.000	
3	Wet well diameter to be provided	m	6.000	





ELAMKULAM STP-From WW4 (Blk.5) to IC@STP

Valve Chamber		
Length	2.30	m
Breadth	3.80	m
Total Depth	1.90	m
penstock depth-G rit /screer	5.00	m
penstock depth-Suction well	5.00	m
Silt Pit		
Length	1.5	m
Width	1.5	m
Depth	1.2	m

Valve Chamber*			
D ia, mrr	L, m	B, m	D , r
100	1.4	3.3	1.4
150	1.5	3.4	1.5
200	1.6	3.5	1.5
250	1.8	3.5	1.6
300	1.9	3.6	1.7
350	2.1	3.7	1.8
400	2.3	3.8	1.9
450	2.4	3.9	2.1
500	2.4	3.9	2.2
600	2.8	4.7	2.4
700	2.9	4.8	2.7
750	2.9	4.8	2.8
800	3	4.9	3
900	3.1	5	3.2
1000	3.2	5.1	3.4

SPS D AT/		
Depth of Suction Well	7.45	m
Dia of Suction Well	6.00	m
Pump HP	35.00	HP
RM Delivery Pipe Dia.	400.00	mm
SCREEN WELL D AT/		
G .L	1.65	m
I.L of incoming pipe	-3.19	m
Dia of G rit Well	3.00	m
Incoming Pipe Dia. Of Network	200.00	mm
Total width of the Screen	1.00	m
Slant height of Screen	1.50	m
Depth	6.10	m

SOURCE :

wt.of 25x3 mm flat=0.59 kg/m	0.59
wt.of 12x3 mm flat=0.28 kg/m	0.28
wt.of 25x6 mm flat=1.18 kg/m	1.18
wt.of 50x10 mm flat=3.92 kg/m	3.92
wt.of 50x50 x6mm angle=4.47 kg/m	4.47
wt.of 150x75 x10mm angle=16.9 kg/m	16.9
wt.of ISMB 300mm =42.2 kg/m	42.2
wt.of ISMB 400mm =66.3 kg/m	66.3
wt.of ISMB 600mm =122 kg/m	122

Pipe Depth at IntCon.	5.00	m
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Grit Well					
D esign of Grit Well					
Depth of G rit Wel	6.10	m		Total Depth(m)	6.85
Parapet Height	1.00	m		outer dia (m)	3.9
Total Height of well + Parapet	7.10	m		centre dia(m)	3.45
Dia of G rit Well	3	m		raft dia(m)	3.00
Thickness of wall	0.45	m		Screen Horizontal platform width(m)	1.5
Thickness of Raft Slab	0.45	m		Screen Mesh Opening(m)	0.6
Thickness of Plugging	0.30	m			
D esign of kerb					
Diameter of grit well	3.00	m		Extra width for Excavation for working including both sides	1.2
Well wall thickness	0.45	m		Benching depth assumed	0.25
Kerb wall thickness at top	0.53	m			
Kerb wall thickness at bottom	0.15	m			
kerb height outer	1.05	m			
kerb height inner	0.45	m			
kerb height outer excluding inner	0.60	m			
kerb slope	0.71	m			
Thickness of raft	0.45	m			
Thickness of plugging	0.30	m			
Circumference of well kerb (l)	11.07	m			
Volume of Kerb	4.86	cu.m			

Suction Well						
Design Data						
Depth of Suction Well	7.45	m			Screen Mesh Opening for Pump	
Parapet Height	1.00	m			Length(m)	1.5
Total Height of well + Parapet	8.45	m			Breadth(m)	1.5
Dia of Suction Well	6.00	m			Outer Dia (m)	7.2
Thickness of wall	0.6	m			Center Dia (m)	6.60
Thickness of Raft Slab	0.6	m			Raft Dia (m)	6.00
Thickness of Plugging	0.4	m			Total Depth	8.45
Design of kerb						
Diameter of wall	6.00	m				
Well wall thickness	0.60	m				
Kerb wall thickness at top	0.68	m				
Kerb wall thickness at bottom	0.15	m				
kerb height outer	1.33	m				
kerb height inner	0.60	m				
kerb height outer excluding inner	0.73	m				
kerb slope	0.90	m				
Thickness of raft	0.60	m				
Thickness of plugging	0.40	m				
Circumference of well kerb (l)	20.97	m				
Volume of Kerb	4.50	cu.m				

DESIGN OF PUMPING MAIN FROM WET WELL for Perandoor 1A at STP to Receiving Chamber

BASIC DATA		
GL AT Wet well site	1.650	m
Top level of receiving chamber	7.980	m
Residual Head	2.000	m
TOTAL HEAD REQUIRED AT END	7.980	m
FOOT VALVE LEVEL	-5.800	m
Static head including Residual Head	15.780	m
Number of reaches	1	
Length	300	m

Combination	Pipes selected
I	250 DI K9
II	300 DI K9
III	350 DI K9
IV	400 DI K9
V	450 DI K9

INTERMED IATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	D istance (m)	Pipe			D isc. In lpm	V elcity-mps	Grade	Friction Loss	OL	TL	H GL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	1.65											20.30	18.65	AT WET WELL
0	300	7.98	300	250	DI-K9	140	9326	3.167	32	9.38	0.94	10.32	9.98	2.00	AT STP SITE
									TOTAL	9.38	0.94	10.32			
Combination II															
	0	1.65											14.16	12.51	AT WET WELL
0	300	7.98	300	300	DI-K9	140	9326	2.199	79	3.8	0.38	4.18	9.98	2.00	AT STP SITE
									TOTAL	3.8	0.38	4.18			
Combination III															
	0	1.65											11.96	10.31	AT WET WELL
0	300	7.98	300	350	DI-K9	140	9326	1.616	167	1.8	0.18	1.98	9.98	2.00	AT STP SITE
									TOTAL	1.8	0.18	1.98			
Combination IV															
	0	1.65											11.01	9.36	AT WET WELL
0	300	7.98	300	400	DI-K9	140	9326	1.237	320	0.94	0.09	1.03	9.98	2.00	AT STP SITE
									TOTAL	0.94	0.09	1.03			
Combination V															
	0	1.65											10.56	8.91	AT WET WELL
0	300	7.98	300	450	DI-K9	140	9326	0.977	568	0.53	0.05	0.58	9.98	2.00	AT STP SITE
									TOTAL	0.53	0.05	0.58			

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	D istance (m)	Pipe			D isc. In lpm	V elcity-mps	Grade	Friction Loss	OL	TL	H GL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	1.65											21.76	20.11	AT WET WELL
0	300	7.98	300	250	DI-K9	140	10139	3.442	28	10.71	1.07	11.78	9.98	2.00	AT STP SITE
									TOTAL	10.71	1.07	11.78			
Combination II															
	0	1.65											14.83	13.18	AT WET WELL
0	300	7.98	300	300	DI-K9	140	10139	2.391	68	4.41	0.44	4.85	9.98	2.00	AT STP SITE
									TOTAL	4.41	0.44	4.85			
Combination III															
	0	1.65											12.29	10.64	AT WET WELL
0	300	7.98	300	350	DI-K9	140	10139	1.756	143	2.1	0.21	2.31	9.98	2.00	AT STP SITE
									TOTAL	2.1	0.21	2.31			
Combination IV															
	0	1.65											11.18	9.53	AT WET WELL
0	300	7.98	300	400	DI-K9	140	10139	1.345	274	1.09	0.11	1.20	9.98	2.00	AT STP SITE
									TOTAL	1.09	0.11	1.20			
Combination V															
	0	1.65											10.66	9.01	AT WET WELL
0	300	7.98	300	450	DI-K9	140	10139	1.062	487	0.62	0.06	0.68	9.98	2.00	AT STP SITE
									TOTAL	0.62	0.06	0.68			

TABLE 2. TOTAL H EAC							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	15.78	9.38	0.938	26.10	10.71	1.071	27.56
II	15.78	3.8	0.38	19.96	4.41	0.441	20.63
III	15.78	1.8	0.18	17.76	2.1	0.21	18.09
IV	15.78	0.94	0.094	16.81	1.09	0.109	16.98
V	15.78	0.53	0.053	16.36	0.62	0.062	16.46

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	9326	26	76	80	10139	28	87	90
II	9326	20	58	60	10139	21	65	70
III	9326	18	52	55	10139	18	57	60
IV	9326	17	49	50	10139	17	54	55
V	9326	16	48	50	10139	16	52	55

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	80	46000	3680000	90	46000	4140000	991083	4671083
II	60	46000	2760000	70	46000	3220000	770842	3530842
III	55	46000	2530000	60	46000	2760000	660722	3190722
IV	50	47000	2350000	55	46000	2530000	605662	2955662
V	50	47000	2350000	55	46000	2530000	605662	2955662

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		10							
Comb inatio	Intermediate Stage				Ultimate Stage						Total cost			
	BH F	Units	Cost	Capitalised	BH F	Units	Cost	Capitalised cost	Equ.cost					
I	76	497899	4978990	45453624	87	571613	5716130	52183038	12492204	57945829				
II	58	380792	3807920	34762826	65	427909	4279090	39064177	9351654	44114480				
III	52	338838	3388380	30932810	57	375172	3751720	34249772	8199123	39131933				
IV	49	320801	3208010	29286197	54	352169	3521690	32149808	7696409	36982605				
V	48	312175	3121750	28498722	52	341452	3414520	31171444	7462196	35960918				

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	250 DI K9	300	3367	1010100
		TOTAL		1010100
II	300 DI K9	300	4251	1275300
		TOTAL		1275300
III	350 DI K9	300	5188	1556400
		TOTAL		1556400
IV	400 DI K9	300	6226	1867800
		TOTAL		1867800
V	450 DI K9	300	7485	2245500
		TOTAL		2245500

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	1010100	4671083	5681183
II	1275300	3530842	4806142
III	1556400	3190722	4747122
IV	1867800	2955662	4823462
V	2245500	2955662	5201162

TABLE 8. Cost of installation and maintenance

Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size	Inter. Pump set	Ult. Pump set Cap.
1	2	3	4. (2 + 3)	5.	6.	7.
I	5681183	57945829	63627012	250 DI K9	80	90
II	4806142	44114480	48920622	300 D I	60	70
III	4747122	39131933	43879055	350 DI K9	55	60
IV	4823462	36982605	41806067	400 DI K9	50	55
V	5201162	35960918	41162080	450 D I	50	55

Hence Combination V consisting of 450 D I K9 300 m x 50 H F is found to be economical

DESIGN OF PUMPING MAIN FROM WET WELL TO PROPOSED ST

BASIC DATA		
GL AT Wet well site	1.650	m
Top level of receiving chamber	7.980	m
Residual Head	2.000	m
TOTAL HEAD REQUIRED AT END	7.980	m
FOOT VALVE LEVEL	-5.800	m
Static head including Residual Head	15.780	m
Number of reaches	1	
Length	300	m

Combination	Pipes selected
I	250 DI K9
II	300 DI K9
III	350 DI K9
IV	400 DI K9
V	450 DI K9

INTERMEDIATE STAGE																
TABLE1. FRICTION LOSS																
Chainage (m)		GL	Distance (m)	Pipe			Discharge (lpm)	Velocity (mps)	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS	
Start	End			Size in mm	Type & Class	C' value										
Combination I																
	0	1.65											14.77	13.12	AT WET WELL	
0	300	7.98	300	250	DI-K9	140	6222	2.113	69	4.35	0.44	4.79	9.98	2.00	AT STP SITE	
									TOTAL	4.35	0.44	4.79				
Combination II																
	0	1.65											11.96	10.31	AT WET WELL	
0	300	7.98	300	300	DI-K9	140	6222	1.467	167	1.8	0.18	1.98	9.98	2.00	AT STP SITE	
									TOTAL	1.8	0.18	1.98				
Combination III																
	0	1.65											10.92	9.27	AT WET WELL	
0	300	7.98	300	350	DI-K9	140	6222	1.078	354	0.85	0.09	0.94	9.98	2.00	AT STP SITE	
									TOTAL	0.85	0.09	0.94				
Combination IV																
	0	1.65											10.46	8.81	AT WET WELL	
0	300	7.98	300	400	DI-K9	140	6222	0.825	678	0.44	0.04	0.48	9.98	2.00	AT STP SITE	
									TOTAL	0.44	0.04	0.48				
Combination V																
	0	1.65											10.26	8.61	AT WET WELL	
0	300	7.98	30													

ULTIMATE STAGE																
TABLE1. FRICTION LOSS																
Chainage (m)		GL	D istance (m)	Pipe			D isc. In lpm	V elcity-mps	Grade	Friction Loss	OL	TL	H GL	RH	REMARKS	
Start	End			Size in mm	Type & Class	C' value										
Combination I																
	0	1.65											15.57	13.92	AT WET WELL	
0	300	7.98	300	250	DI-K9	140	6764	2.297	59	5.08	0.51	5.59	9.98	2.00	AT STP SITE	
									TOTAL	5.08	0.51	5.59				
Combination II																
	0	1.65											12.29	10.64	AT WET WELL	
0	300	7.98	300	300	DI-K9	140	6764	1.595	143	2.1	0.21	2.31	9.98	2.00	AT STP SITE	
									TOTAL	2.1	0.21	2.31				
Combination III																
	0	1.65											11.07	9.42	AT WET WELL	
0	300	7.98	300	350	DI-K9	140	6764	1.172	303	0.99	0.10	1.09	9.98	2.00	AT STP SITE	
									TOTAL	0.99	0.10	1.09				
Combination IV																
	0	1.65											10.55	8.90	AT WET WELL	
0	300	7.98	300	400	DI-K9	140	6764	0.897	581	0.52	0.05	0.57	9.98	2.00	AT STP SITE	
									TOTAL	0.52	0.05	0.57				
Combination V																
	0	1.65											10.30	8.65	AT WET WELL	
0	300	7.98	300	450	DI-K9	140	6764	0.709	1030	0.29	0.03	0.32	9.98	2.00	AT STP SITE	
									TOTAL	0.29	0.03	0.32				

TABLE 2. TOTAL H EAL							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	15.78	4.35	0.435	20.57	5.08	0.508	21.37
II	15.78	1.8	0.18	17.76	2.1	0.21	18.09
III	15.78	0.85	0.085	16.72	0.99	0.099	16.87
IV	15.78	0.44	0.044	16.26	0.52	0.052	16.35
V	15.78	0.25	0.025	16.06	0.29	0.029	16.10

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	6222	21	40	45	6764	21	45	50
II	6222	18	35	35	6764	18	38	40
III	6222	17	33	35	6764	17	36	40
IV	6222	16	32	35	6764	16	35	35
V	6222	16	31	35	6764	16	34	35

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	45	47000	2115000	50	47000	2350000	562571	2677571
II	35	50000	1750000	40	47000	1880000	450057	2200057
III	35	50000	1750000	40	47000	1880000	450057	2200057
IV	35	50000	1750000	35	50000	1750000	418936	2168936
V	35	50000	1750000	35	50000	1750000	418936	2168936

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		10								
Comb inatio	Intermediate Stage				Ultimate Stage					Total cost					
	BH F	Units	Cost	Capitalised	BH F	Units	Cost	Capitalised cost	Equ.cost						
I	40	261790	2617900	23899032	45	295642	2956420	26989410	6461050	30360083					
II	35	226044	2260440	20635749	38	250289	2502890	22849096	5469892	26105641					
III	33	212778	2127780	19424685	36	233429	2334290	21309932	5101428	24526113					
IV	32	207028	2070280	18899763	35	226240	2262400	20653643	4944318	23844080					
V	31	204348	2043480	18655103	34	222777	2227770	20337502	4868636	23523740					

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	250 DI K9	300	3367	1010100
		TOTAL		1010100
II	300 DI K9	300	4251	1275300
		TOTAL		1275300
III	350 DI K9	300	5188	1556400
		TOTAL		1556400
IV	400 DI K9	300	6226	1867800
		TOTAL		1867800
V	450 DI K9	300	7485	2245500
		TOTAL		2245500

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	1010100	2677571	3687671
II	1275300	2200057	3475357
III	1556400	2200057	3756457
IV	1867800	2168936	4036736
V	2245500	2168936	4414436

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	2	3	4. (2 + 3)	5.	6.	7.
I	3687671	30360083	34047754	250 DI K9	45	50
II	3475357	26105641	29580998	300 DI K9	35	40
III	3756457	24526113	28282570	350 DI K9	35	40
IV	4036736	23844080	27880816	400 DI K9	35	35
V	4414436	23523740	27938176	450 DI K9	35	35

Hence Combination IV consisting of 400 DI K9 300 m x 35 H F is found to be economical

DESIGN OF PUMPING MAIN FROM WET WELL TO PROPOSED ST

BASIC DATA		
GL AT Wet well site	1.65	m
Top level of receiving chamber	7.98	m
Residual Head	2.00	m
TOTAL HEAD REQUIRED AT END	7.98	m
FOOT VALVE LEVEL	-5.80	m
Static head including Residual Head	15.78	m
Number of reaches	1	
Length	300	m

Combination	Pipes selected
I	250 DI K9
II	300 DI K9
III	350 DI K9
IV	400 DI K9
V	450 DI K9

INTERMEDIATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Discharge (lpm)	Velocity (mps)	Grade	Friction Loss	OL	TL	HGL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	1.65											11.31	9.66	AT WET WELL
0	300	7.98	300	250	DI-K9	140	3111	1.056	248	1.21	0.12	1.33	9.98	2.00	AT STP SITE
									TOTAL	1.21	0.12	1.33			
Combination II															
	0	1.65											10.53	8.88	AT WET WELL
0	300	7.98	300	300	DI-K9	140	3111	0.734	602	0.5	0.05	0.55	9.98	2.00	AT STP SITE
									TOTAL	0.5	0.05	0.55			
Combination III															
	0	1.65											10.24	8.59	AT WET WELL
0	300	7.98	300	350	DI-K9	140	3111	0.539	1276	0.24	0.02	0.26	9.98	2.00	AT STP SITE
									TOTAL	0.24	0.02	0.26			
Combination IV															
	0	1.65											10.11	8.46	AT WET WELL
0	300	7.98	300	400	DI-K9	140	3111	0.413	2446	0.12	0.01	0.13	9.98	2.00	AT STP SITE
									TOTAL	0.12	0.01	0.13			
Combination V															
	0	1.65											10.06	8.41	AT WET WELL
0	300	7.98	300	450	DI-K9										

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	D istance (m)	Pipe			D isc. In lpm	Velcity- mps	Grade	Friction Loss	OL	TL	H GL	RH	REMARKS
Start	End			Size in mm	Type & Class	C' value									
Combination I															
	0	1.65											11.54	9.89	AT WET WELL
0	300	7.98	300	250	DI-K9	140	3382	1.148	212	1.42	0.14	1.56	9.98	2.00	AT STP SITE
									TOTAL	1.42	0.14	1.56			
Combination II															
	0	1.65											10.62	8.97	AT WET WELL
0	300	7.98	300	300	DI-K9	140	3382	0.797	516	0.58	0.06	0.64	9.98	2.00	AT STP SITE
									TOTAL	0.58	0.06	0.64			
Combination III															
	0	1.65											10.28	8.63	AT WET WELL
0	300	7.98	300	350	DI-K9	140	3382	0.586	1094	0.27	0.03	0.30	9.98	2.00	AT STP SITE
									TOTAL	0.27	0.03	0.30			
Combination IV															
	0	1.65											10.13	8.48	AT WET WELL
0	300	7.98	300	400	DI-K9	140	3382	0.449	2095	0.14	0.01	0.15	9.98	2.00	AT STP SITE
									TOTAL	0.14	0.01	0.15			
Combination V															
	0	1.65											10.07	8.42	AT WET WELL
0	300	7.98	300	450	DI-K9	140	3382	0.354	3719	0.08	0.01	0.09	9.98	2.00	AT STP SITE
									TOTAL	0.08	0.01	0.09			

TABLE 2. TOTAL H EAC							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	15.78	1.21	0.121	17.11	1.42	0.142	17.34
II	15.78	0.5	0.05	16.33	0.58	0.058	16.42
III	15.78	0.24	0.024	16.04	0.27	0.027	16.08
IV	15.78	0.12	0.012	15.91	0.14	0.014	15.93
V	15.78	0.07	0.007	15.86	0.08	0.008	15.87

TABLE 3. HORSE POWER								
Combination No.	Intermediate Stage				Ultimate Stage			
	Disc. In lpm	Head in 'm'	Actual BHP	Available	Disc. In lpm	head in 'm'	Actual BHP	Available
I	3111	17	17	20	3382	17	18	20
II	3111	16	16	20	3382	16	17	20
III	3111	16	16	20	3382	16	17	20
IV	3111	16	16	20	3382	16	17	20
V	3111	16	15	20	3382	16	17	20

TABLE 4. COST OF PUMPSET								
Combination No.	Intermediate Stage			Ultimate Stage				
	BHP	Rate per Hp	Amount	BHP	Rate per Hp	Amount	Equ.cost	Total cost
I	20	50000	1000000	20	50000	1000000	239392	1239392
II	20	50000	1000000	20	50000	1000000	239392	1239392
III	20	50000	1000000	20	50000	1000000	239392	1239392
IV	20	50000	1000000	20	50000	1000000	239392	1239392
V	20	50000	1000000	20	50000	1000000	239392	1239392

TABLE 5. COST OF ELECTRICAL ENERGY					UNIT RATE		10							
Combination	Intermediate Stage				Ultimate Stage					Total cost				
	BH F	Units	Cost	Capitalised	BH F	Units	Cost	Capitalised cost	Equ.cost					
I	17	108872	1088720	9939018	18	119982	1199820	10953259	2622123	12561141				
II	16	103906	1039060	9485667	17	113578	1135780	10368632	2482168	11967836				
III	16	102141	1021410	9324539	17	111225	1112250	10153825	2430745	11755284				
IV	16	101292	1012920	9247033	17	110245	1102450	10064360	2409328	11656361				
V	15	100900	1009000	9211247	17	109787	1097870	10022549	2399319	11610566				

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/ m	Total cost
I	250 DI K9	300	3367	1010100
		TOTAL		1010100
II	300 DI K9	300	4251	1275300
		TOTAL		1275300
III	350 DI K9	300	5188	1556400
		TOTAL		1556400
IV	400 DI K9	300	6226	1867800
		TOTAL		1867800
V	450 DI K9	300	7485	2245500
		TOTAL		2245500

TABLE 7. Cost of installation			
Combination No.	Cost of Pumping main (Amount from Table.6)	Cost of Pumpset (Total cost from Table.4)	Total cost of installation
1	2	3	4. (2 + 3)
I	1010100	1239392	2249492
II	1275300	1239392	2514692
III	1556400	1239392	2795792
IV	1867800	1239392	3107192
V	2245500	1239392	3484892

TABLE 8. Cost of installation and maintenance						
Combination No.	Cost of Installation (Cost from Table.7)	Cost of Electrical Energy (Cost	Total cost installation & maintenance	Pipe Size and Type	Inter. Pump set Cap.	Ult. Pump set Cap.
1	2	3	4. (2 + 3)	5.	6.	7.
I	2249492	12561141	14810633	250 DI K9	20	20
II	2514692	11967836	14482528	300 D I K9	20	20
III	2795792	11755284	14551076	350 DI K9	20	20
IV	3107192	11656361	14763553	400 DI K9	20	20
V	3484892	11610566	15095458	450 DI K9	20	20

Hence Combination II consisting of 300 D I K9 300 m x 20 H F is found to be economical

Household Sewer Connection

Elamkulam Catchment		
Sl.No	From	
		2025
1	Block 5	11016
2	Block 6	3778
3	Block 7	2060
4	Block 8	16360
5	Block 9	4174
6	Block 10	1189
7	Block 11	2533
8	Block 12	27797
9	Block 13	4346
		73253

1 HSC data

Population taken based on 2025 year data

Population	73253	14651
For House connections	14357	
For commercial connctions	294	

ANNEXURE 6

DRAWINGS : SEWER NETWORK

Consultant:



ANNEXURE 6

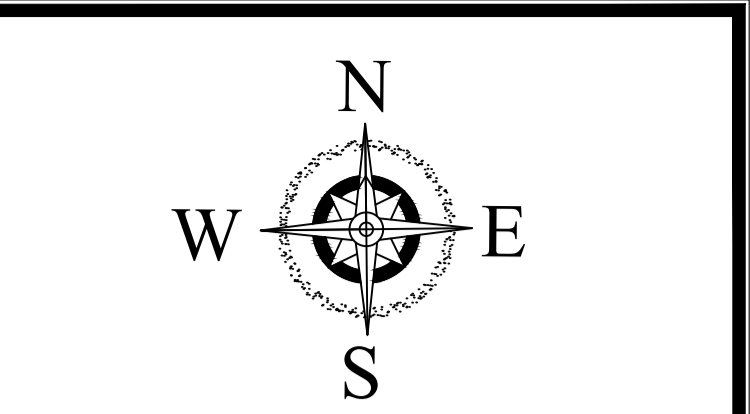
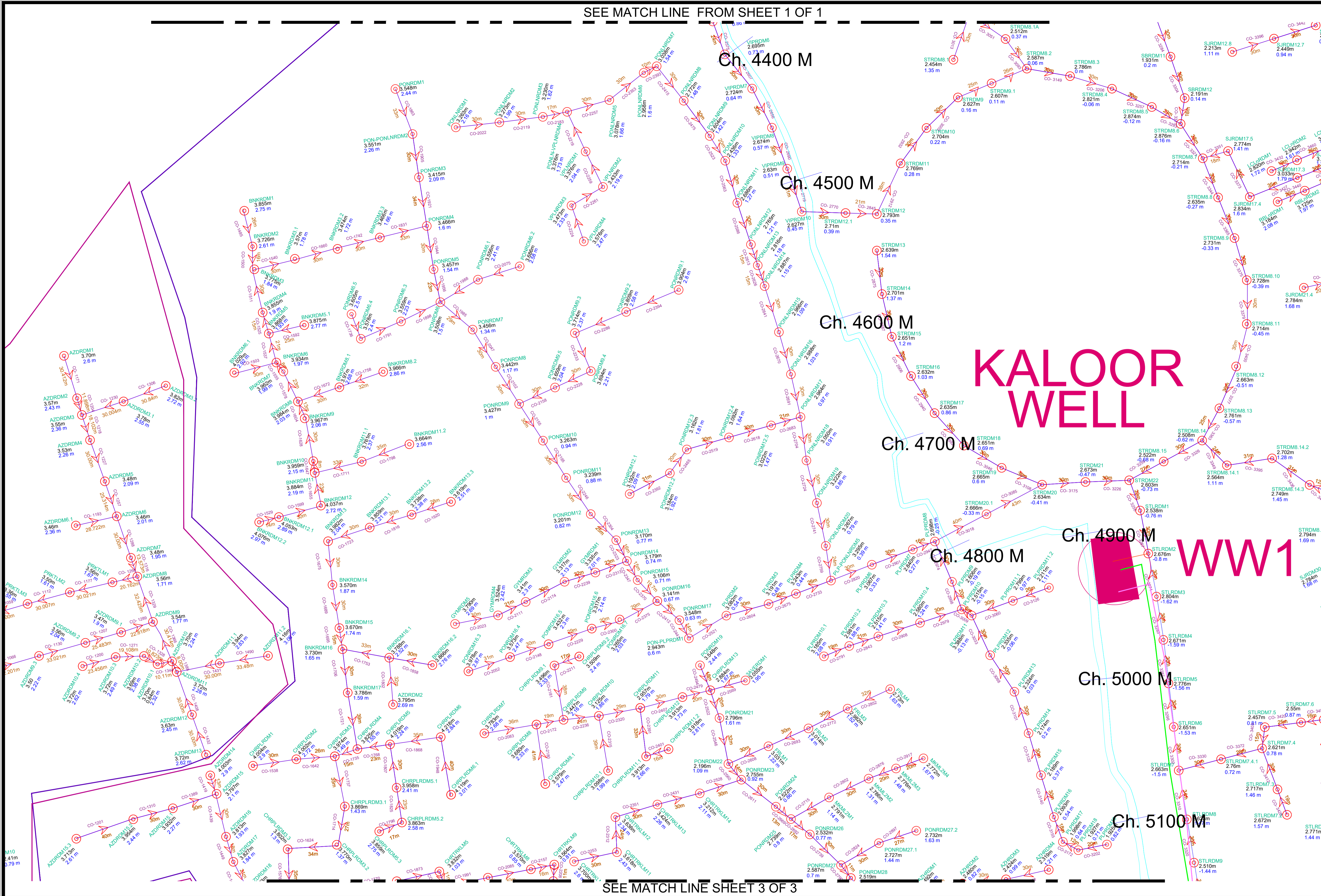
DESIGN AND DRAWINGS : SEWER NETWORK

Project:

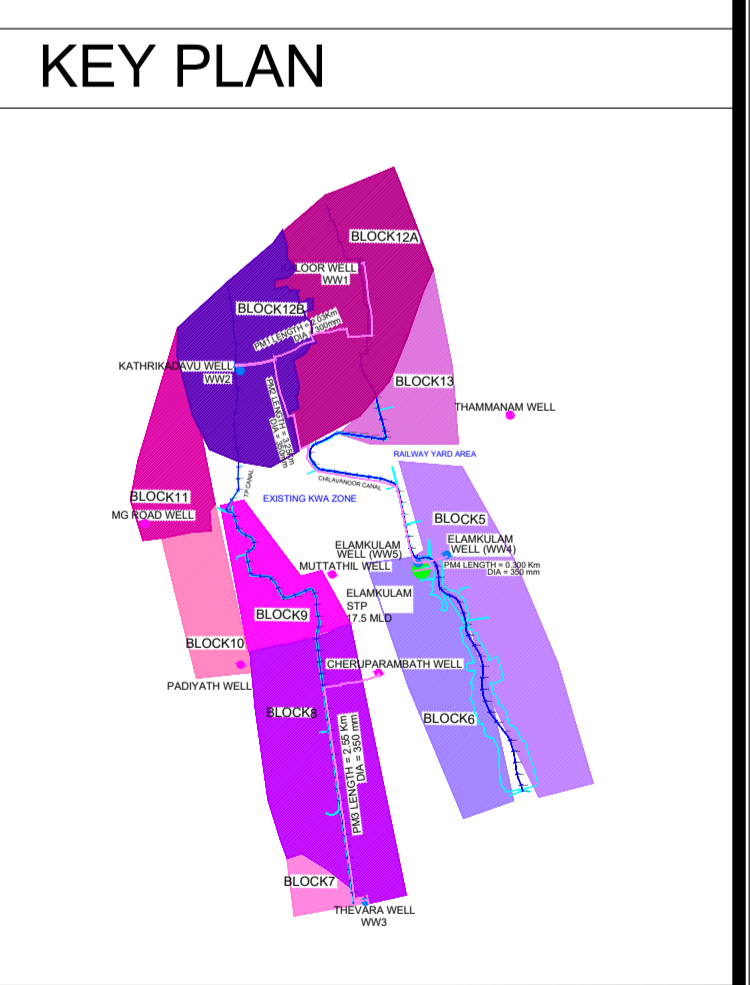
IURWTS

Client:





- LEGEND**
- 200mm Dia PIPE
 - 250mm Dia PIPE
 - 400mm Dia PIPE
 - 450mm Dia PIPE
 - 500mm Dia PIPE
 - 560mm Dia PIPE
 - 630mm Dia PIPE
 - PUMPING MAIN
 - TRUNK MAIN
 - TEXT MANHOLE ID
 - TEXT INVERT LEVEL
 - TEXT MANHOLE ELEVATION
 - MANHOLES
 - FLOW DIRECTION
 - LIFTING MANHOLES
 - IURWTS WET WELLS
 - KWA WET WELLS
 - PROPOSED STP AREA, ELAMKULAM 17.5 MLD



CLIENT:

GENERAL CONSULTANT:

Antea Nederland B.V and Antea India (JV)

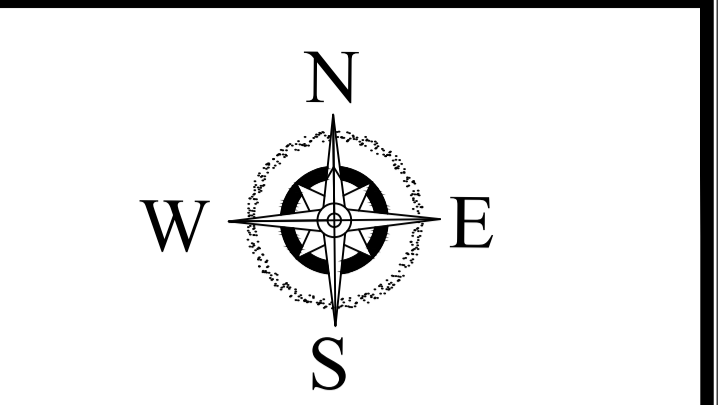
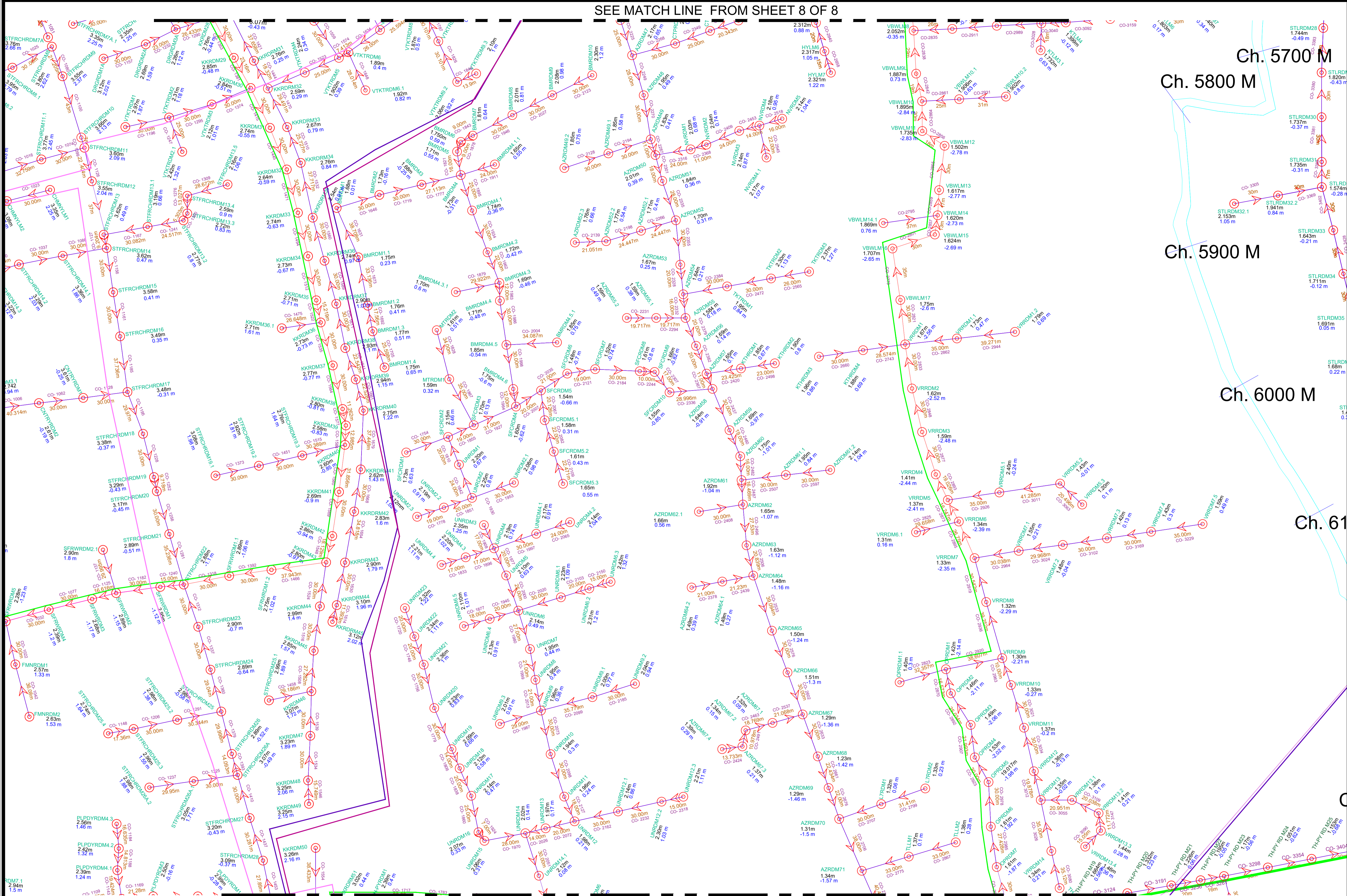
PROJECT:	NAME	SIGN	DATE
	DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG 30/11/2022
	DESIGNED	RESHMA R DIVYA ROSE M	RR DR 25/11/2022
	CHECKED	RENUKA MENON	RM 26/11/2022
	APPROVED	RENUKA MENON	RM 26/11/2022



NO OBJECTION BY KMRL :	
CIVIL	MEP

REVISIONS:			
NO.	DESCRIPTION	DATE	BY
R0	THEVARA_PERANDOOR CANAL Z-VI AND CHILAVANNOOR CANAL Z-IV, SOUTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM	23/12/2021	RR
R1	THEVARA_PERANDOOR CANAL Z-VI AND CHILAVANNOOR CANAL Z-IV, SOUTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM	02/08/2022	RR
R2	THEVARA_PERANDOOR CANAL Z-VI AND CHILAVANNOOR CANAL Z-IV, SOUTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM	19/09/2022	RR
R3	THEVARA_PERANDOOR CANAL Z-VI AND CHILAVANNOOR CANAL Z-IV, SOUTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM	16/11/2022	RR

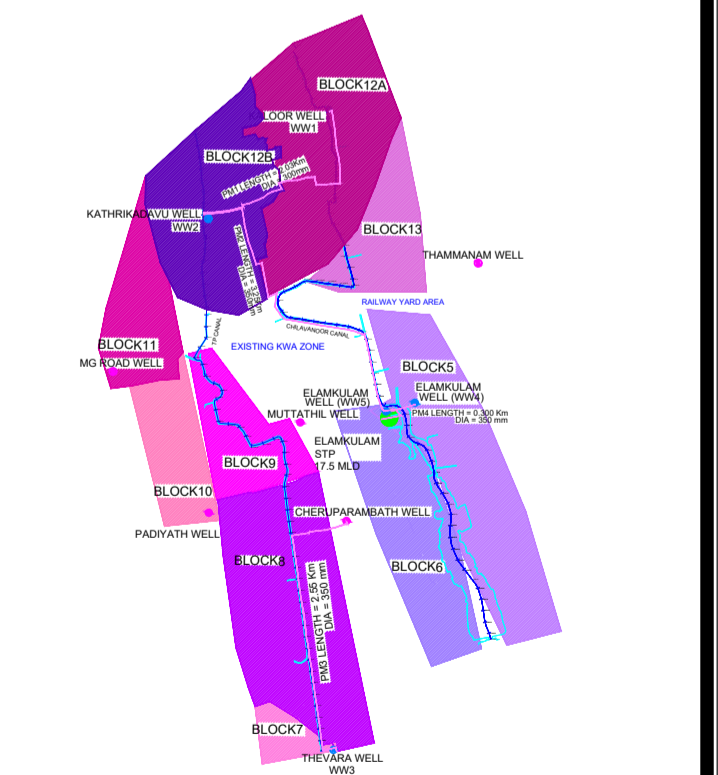
NAME OF PROJECT : INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM			
LOCATION: ELAMKULAM, KOCHI		SCALE: NTS	
TITLE: THEVARA_PERANDOOR CANAL Z-VI AND CHILAVANNOOR CANAL Z-IV, SOUTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM (SHEET- 02)		DATE: 30/11/2022	
DRG. NO : IURWTS-WT2024-CH-CIVIL-1834		REV.: R4	
DIMENSIONS: in MTS		SHEET: 3 OF 31	



LEGEND

- 200mm Dia PIPE
- 250mm Dia PIPE
- 400mm Dia PIPE
- 450mm Dia PIPE
- 500mm Dia PIPE
- 560mm Dia PIPE
- 630mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT MANHOLE ID
- TEXT INVERT LEVEL
- TEXT MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- IURWTS WET WELLS
- KWA WET WELLS
- PROPOSED STP AREA, ELAMKULAM 17.5 MLD

KEY PLAN



CLIENT:

KOCHI METRO RAIL LIMITED

GENERAL CONSULTANT:

Antea Nederland B.V and Antea India (JV)

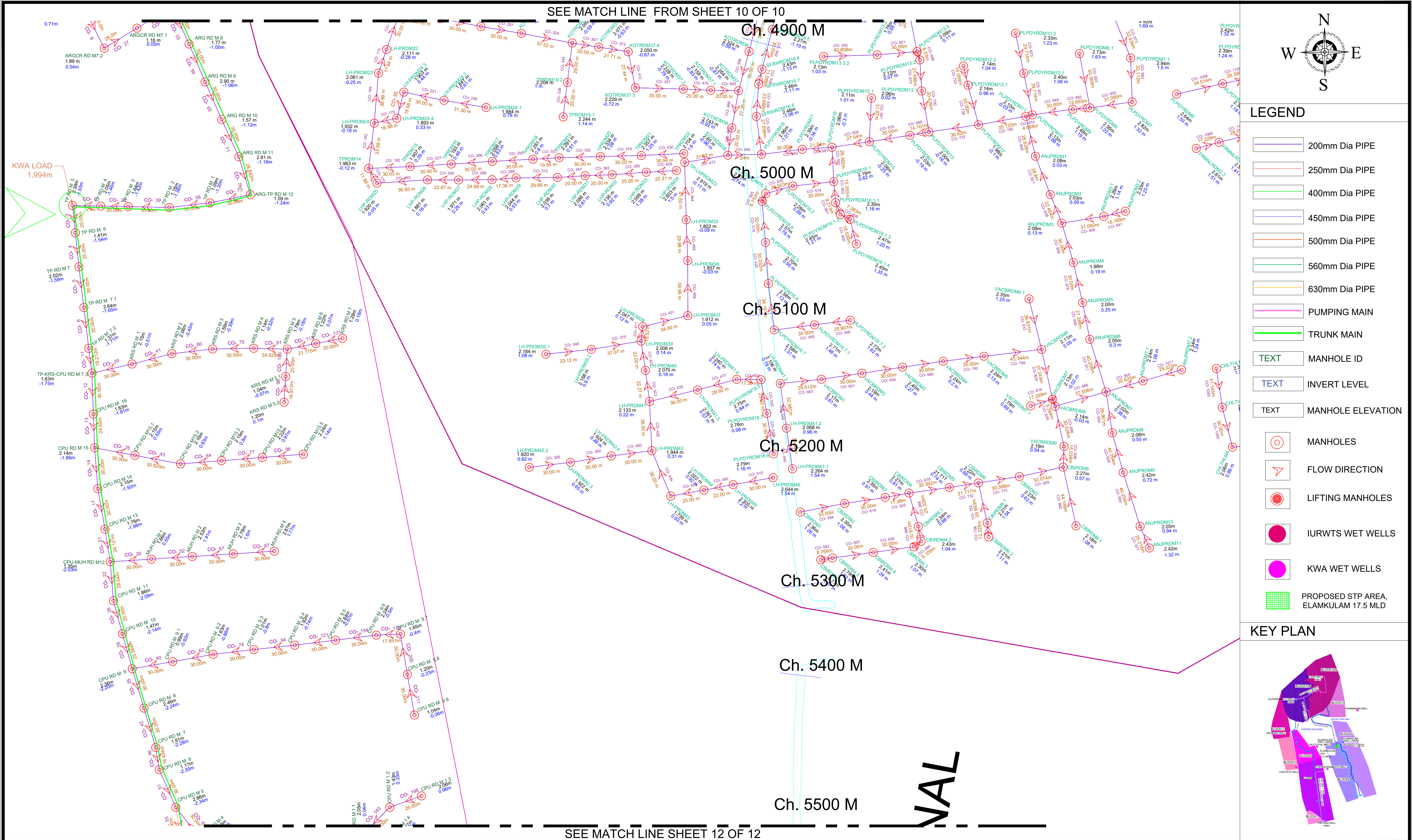
PROJECT:	NAME	SIGN	DATE
	DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG
	DESIGNED	RESHMA R DIVYA ROSE M	RR DR
	CHECKED	RENUKA MENON	RM
	APPROVED	RENUKA MENON	RM




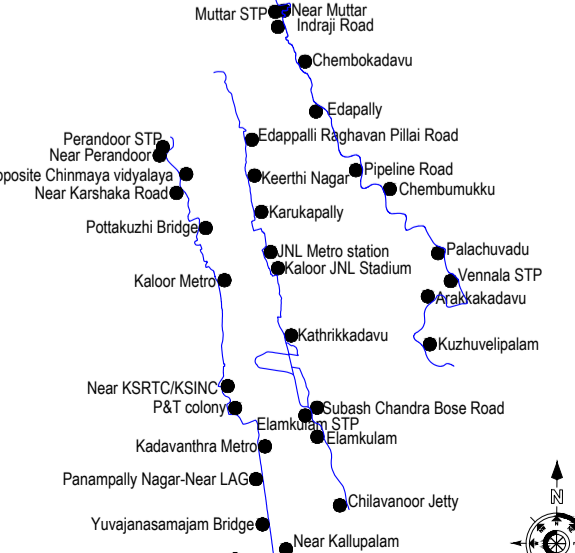


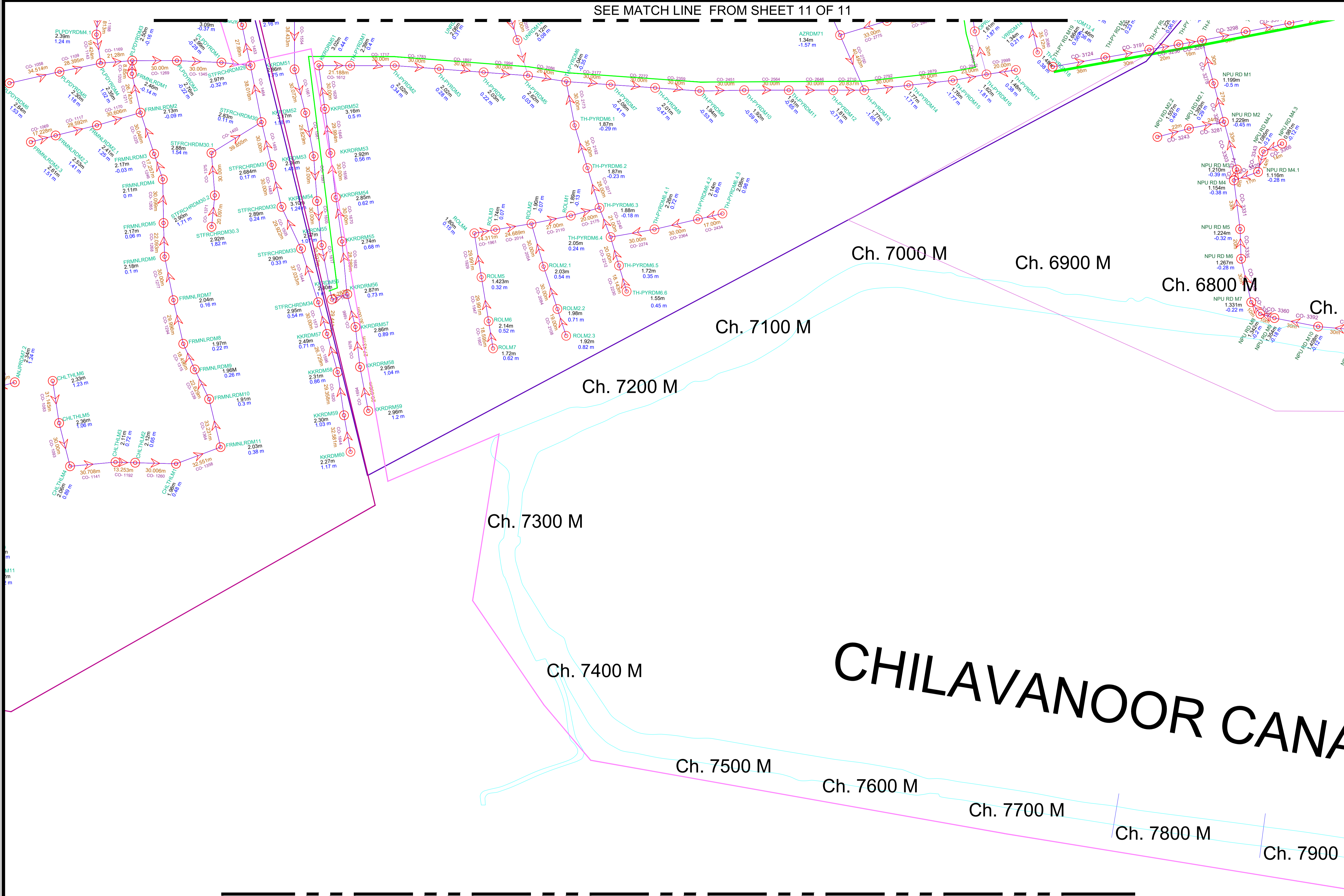
NO OBJECTION BY KMRL :	
CIVIL	MEP

REVISIONS:			
NO.	DESCRIPTION	DATE	BY
R0	THEVARA_PERANDOOR CANAL Z-VI AND CHILAVANOR CANAL Z-IV, SOUTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM	23/12/2021	RR
R1	THEVARA_PERANDOOR CANAL Z-VI AND CHILAVANOR CANAL Z-IV, SOUTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM	02/08/2022	RR
R2	THEVARA_PERANDOOR CANAL Z-VI AND CHILAVANOR CANAL Z-IV, SOUTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM	19/09/2022	RR
R3	THEVARA_PERANDOOR CANAL Z-VI AND CHILAVANOR CANAL Z-IV, SOUTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM	16/11/2022	RR

NAME OF PROJECT : INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM			
LOCATION: ELAMKULAM, KOCHI			SCALE: NTS
TITLE: THEVARA_PERANDOOR CANAL Z-VI AND CHILAVANOR CANAL Z-IV, SOUTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM (SHEET- 09)			DATE: 30/11/2022
DRG. NO : IURWTS-WT2024-CH-CIVIL-1834			REV.: R4
DIMENSIONS: in MTS		SHEET: 10 OF 31	



<div>CLIENT:</div> <div></div> <div>KOCHI METRO RAIL LIMITED</div> <div>GENERAL CONSULTANT:</div> <div></div> <div>Antea Nederland B.V and Antea India (JV)</div>		<div>PROJECT:</div> <div></div> <div>Integrated Urban Regeneration & Water Transport System</div>		<table><tr><th></th><th>NAME</th><th>SIGN</th><th>DATE</th></tr><tr><td>DRAWN</td><td>RAHUL DILIP SEENU ALEX PHILIP GEOPHY</td><td>RD SA PG</td><td>30/11/2022</td></tr><tr><td>DESIGNED</td><td>RESHMA R DIVYA ROSE M</td><td>RR DR</td><td>25/11/2022</td></tr><tr><td>CHECKED</td><td>RENUKA MENON</td><td>RM</td><td>26/11/2022</td></tr><tr><td>APPROVED</td><td>RENUKA MENON</td><td>RM</td><td>26/11/2022</td></tr></table>		NAME	SIGN	DATE	DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	30/11/2022	DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/11/2022	CHECKED	RENUKA MENON	RM	26/11/2022	APPROVED	RENUKA MENON	RM	26/11/2022	<div>KEY PLAN:</div> <div></div>	<div>NO OBJECTION BY KMRL :</div> 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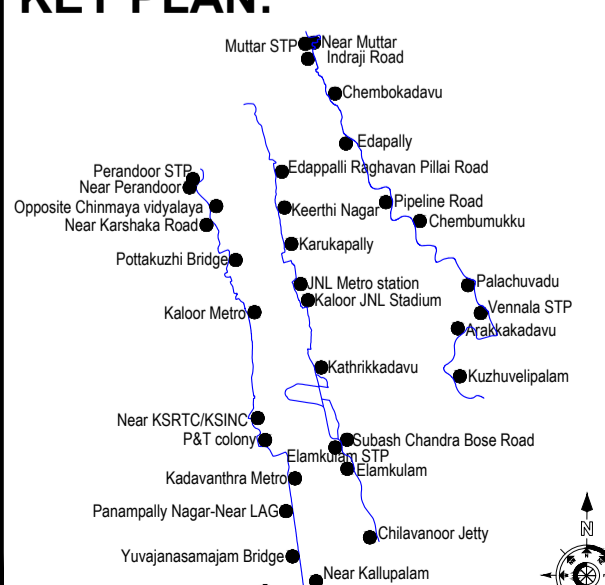
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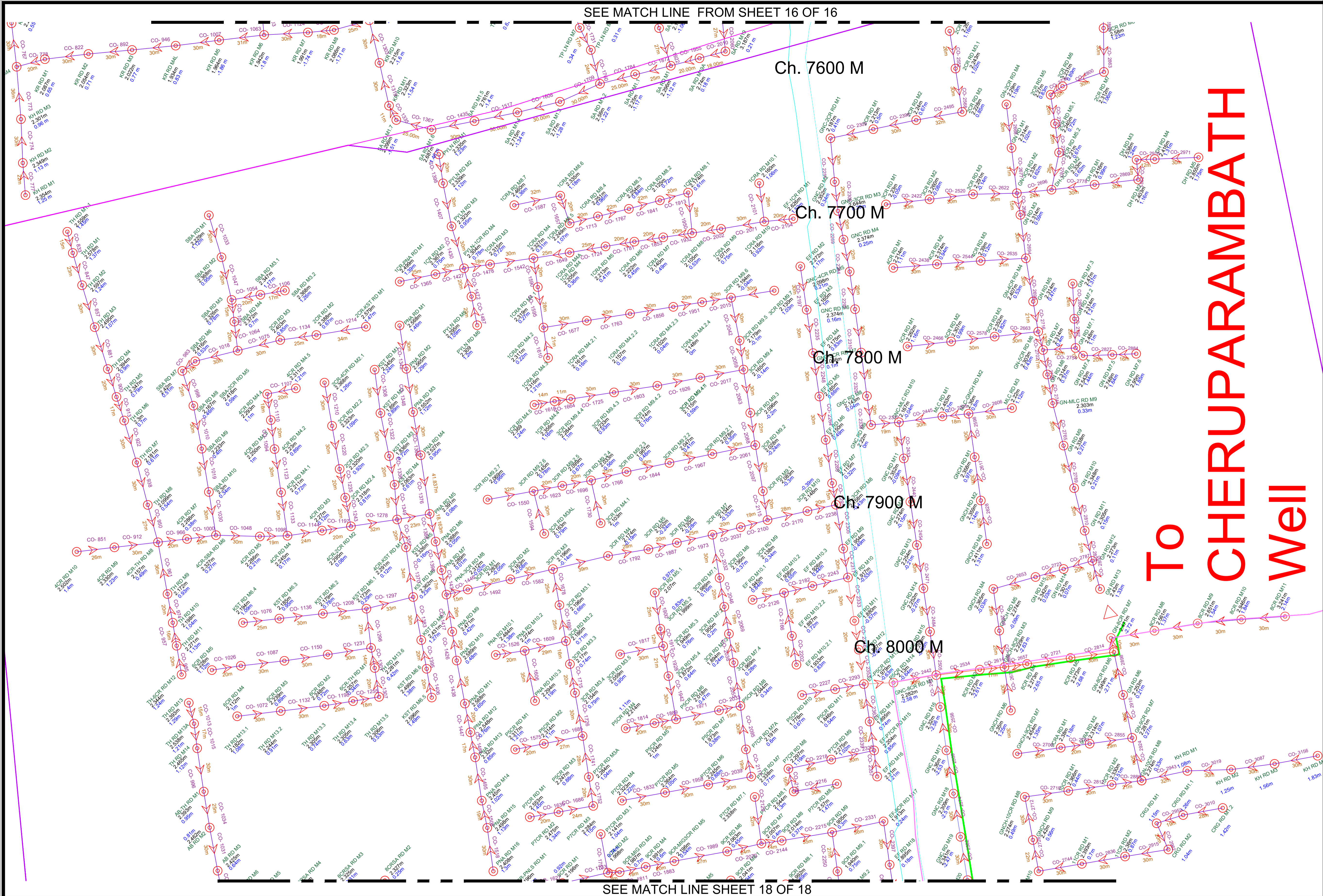
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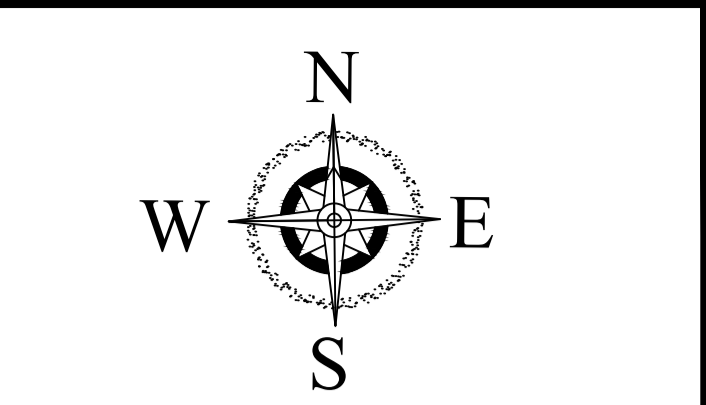
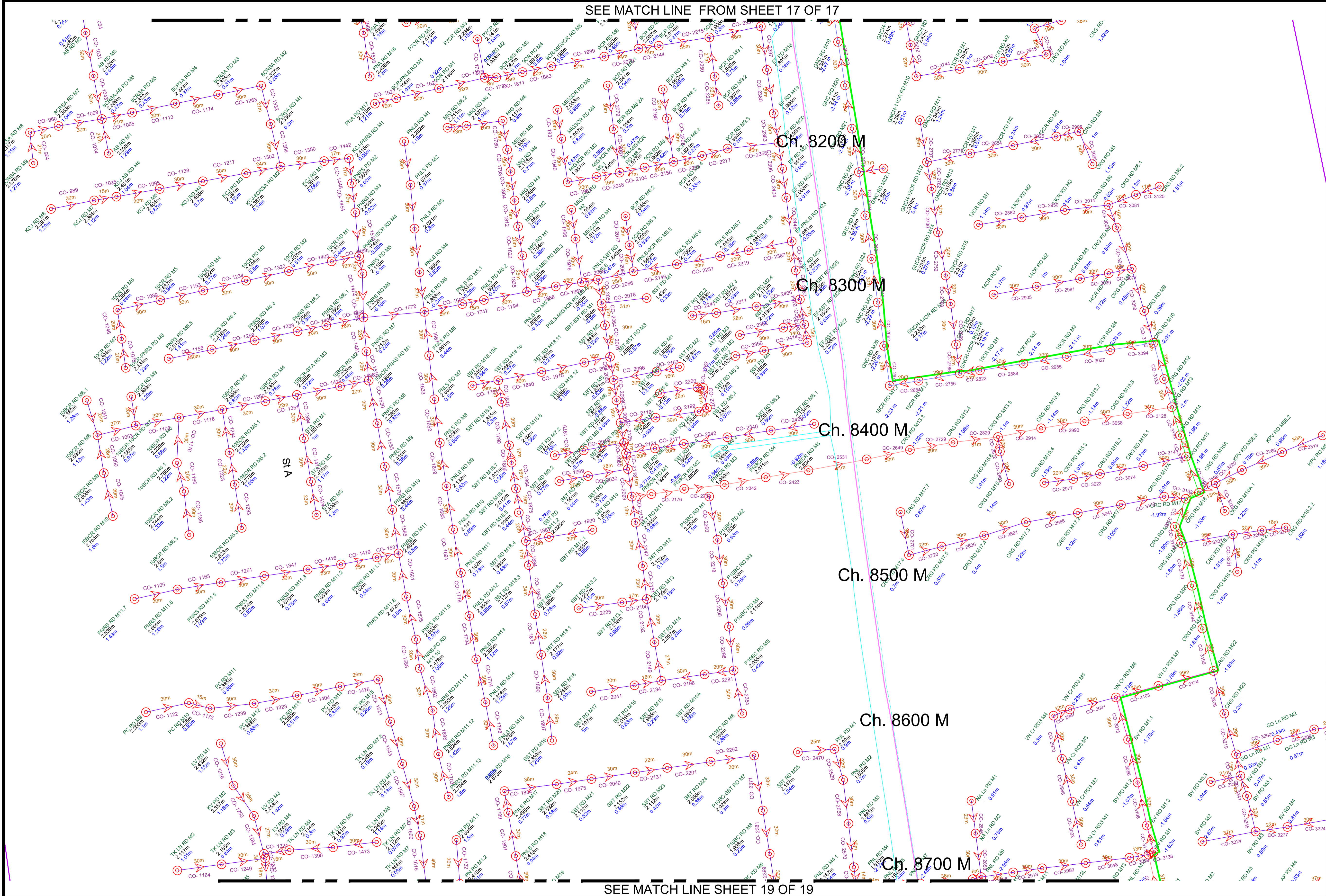
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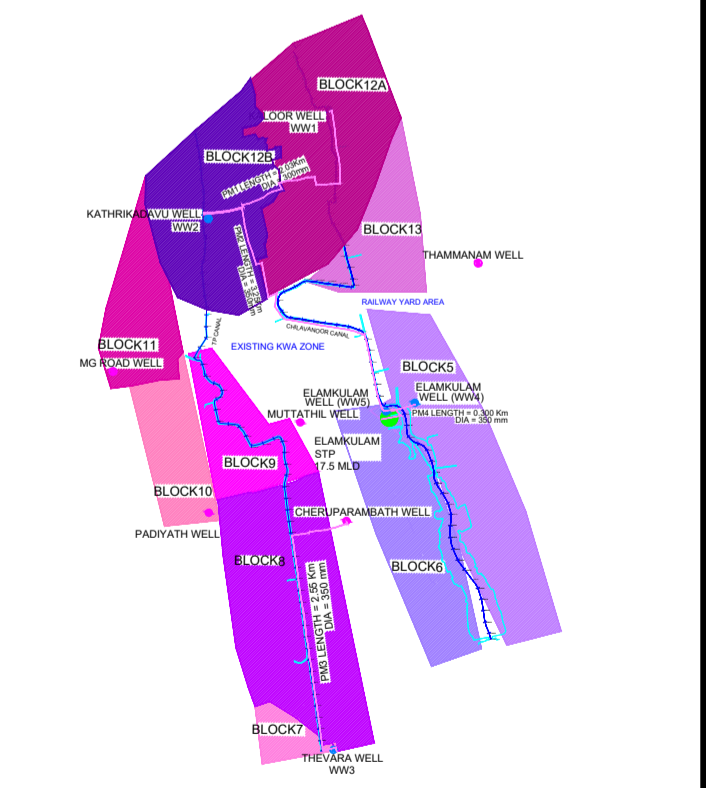





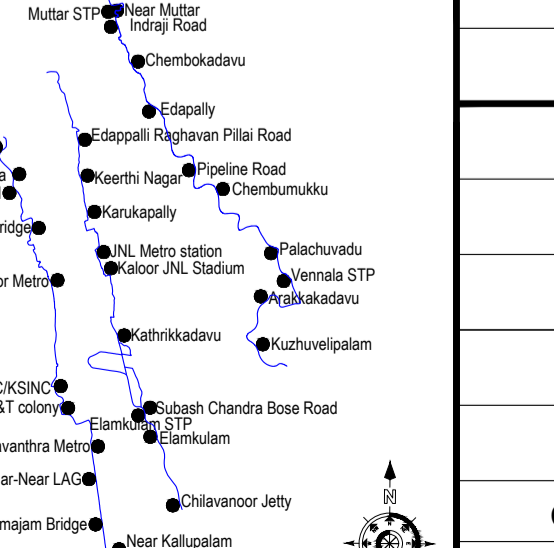


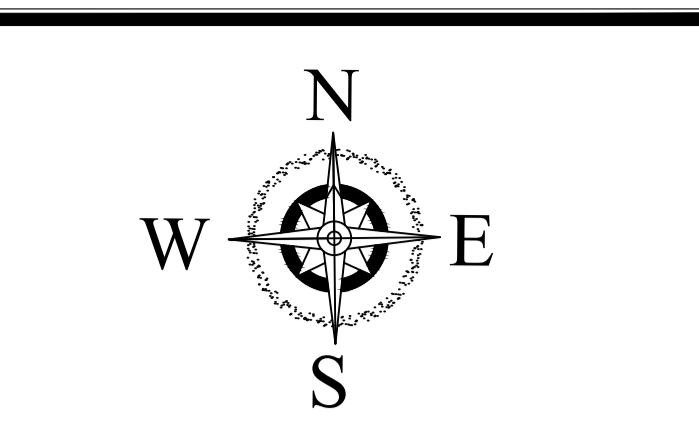
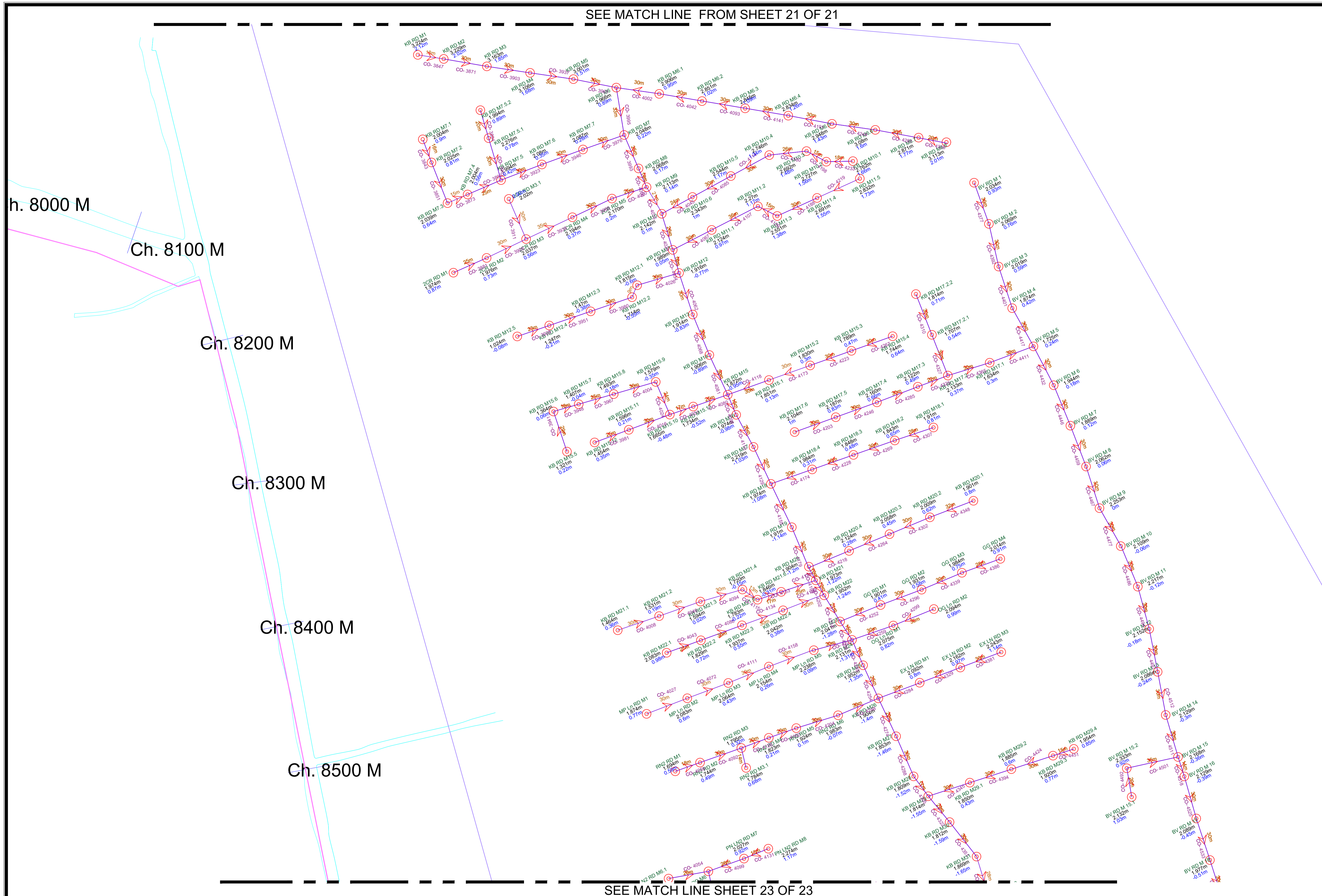
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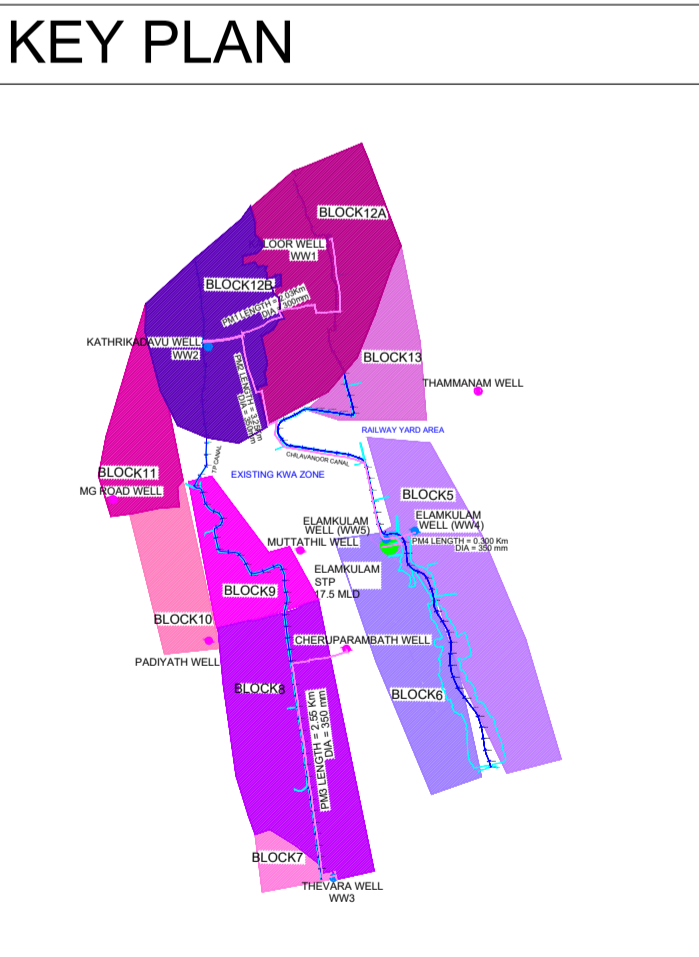
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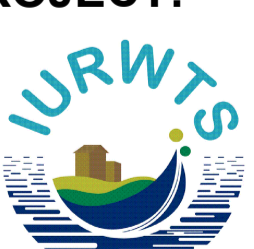
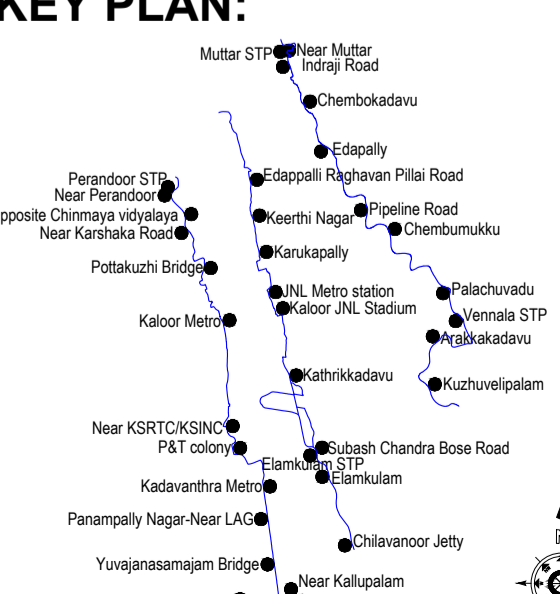


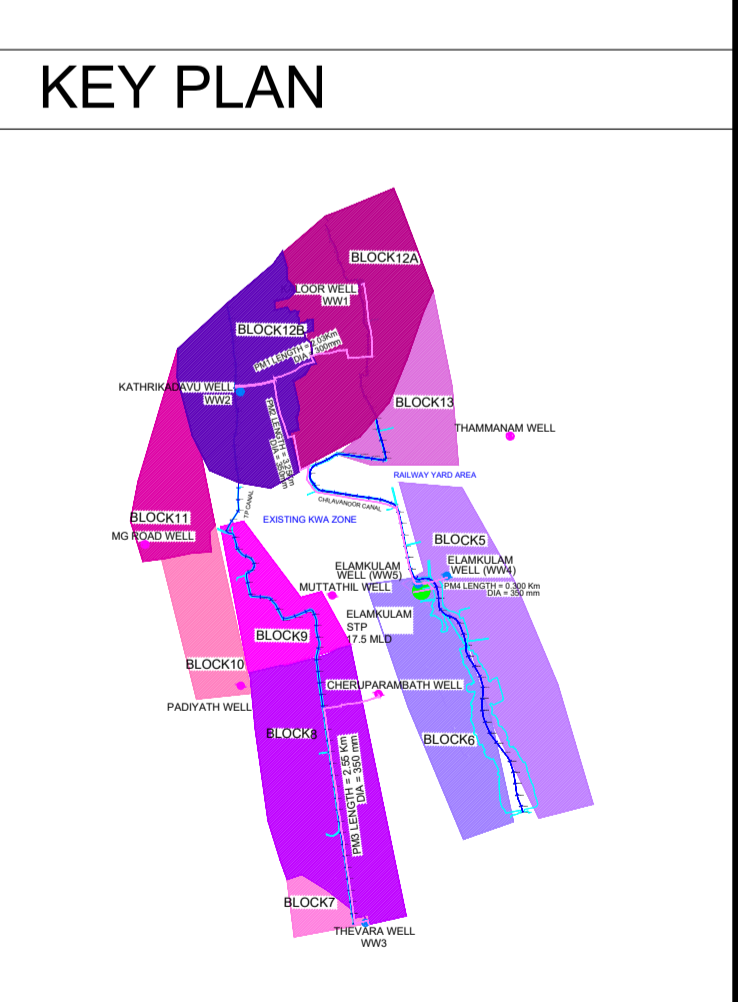
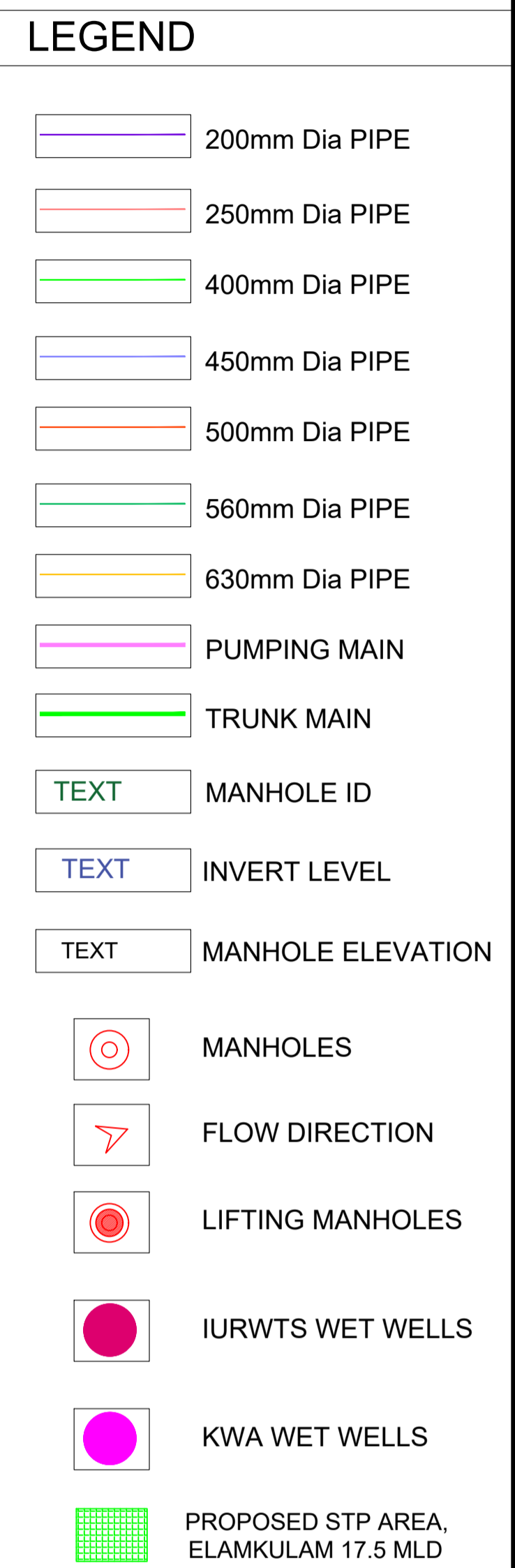
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R2	THEVARA_PERANDOOR CANAL Z-VI AND CHILAVANNOOR CANAL Z-IV, SOUTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM	19/09/2022	RR																																																							
R3	THEVARA_PERANDOOR CANAL Z-VI AND CHILAVANNOOR CANAL Z-IV, SOUTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM	16/11/2022	RR																																																							
LOCATION: ELAMKULAM,KOCHI	SCALE: NTS																																																									
TITLE: THEVARA_PERANDOOR CANAL Z-VI AND CHILAVANNOOR CANAL Z-IV, SOUTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM (SHEET- 18)	DATE: 30/11/2022																																																									
	REV.: R4																																																									
DRG. NO : IURWTS-WT2024-CH-CIVIL-1834	DIMENSIONS: in MTS	SHEET: 19 OF 31																																																								
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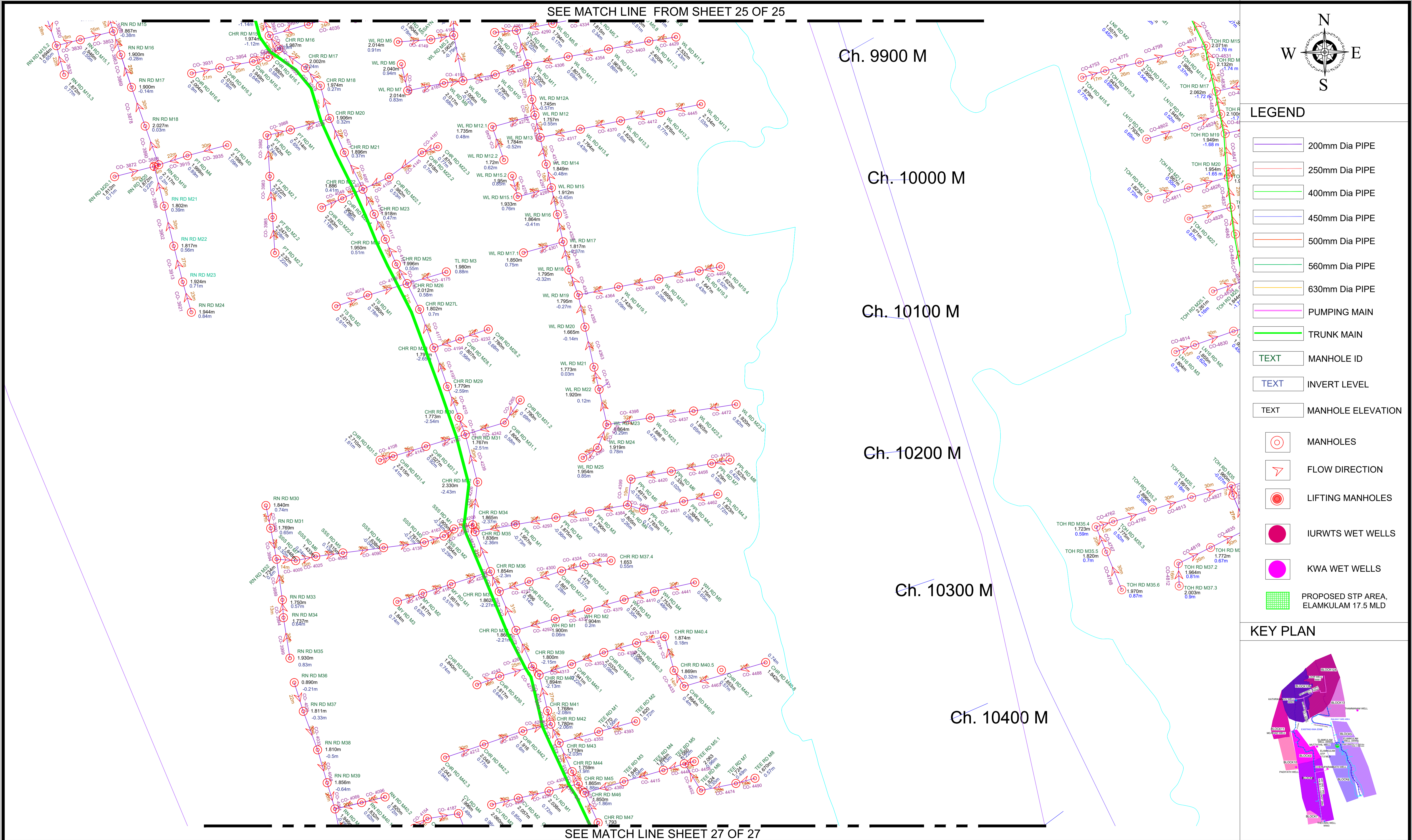





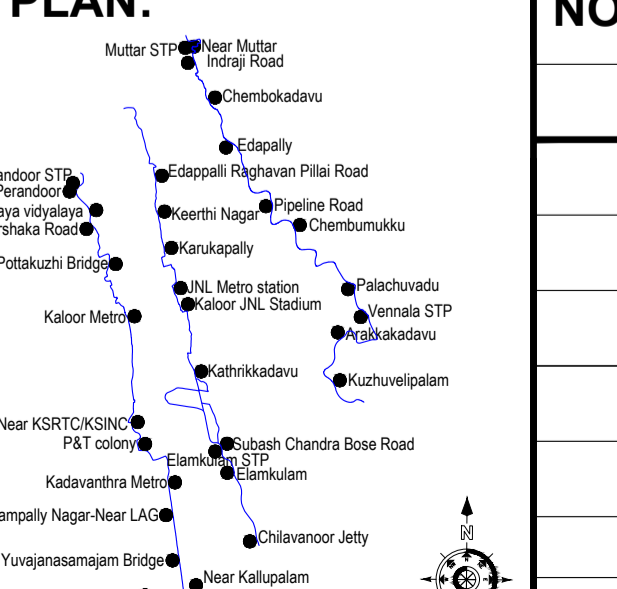
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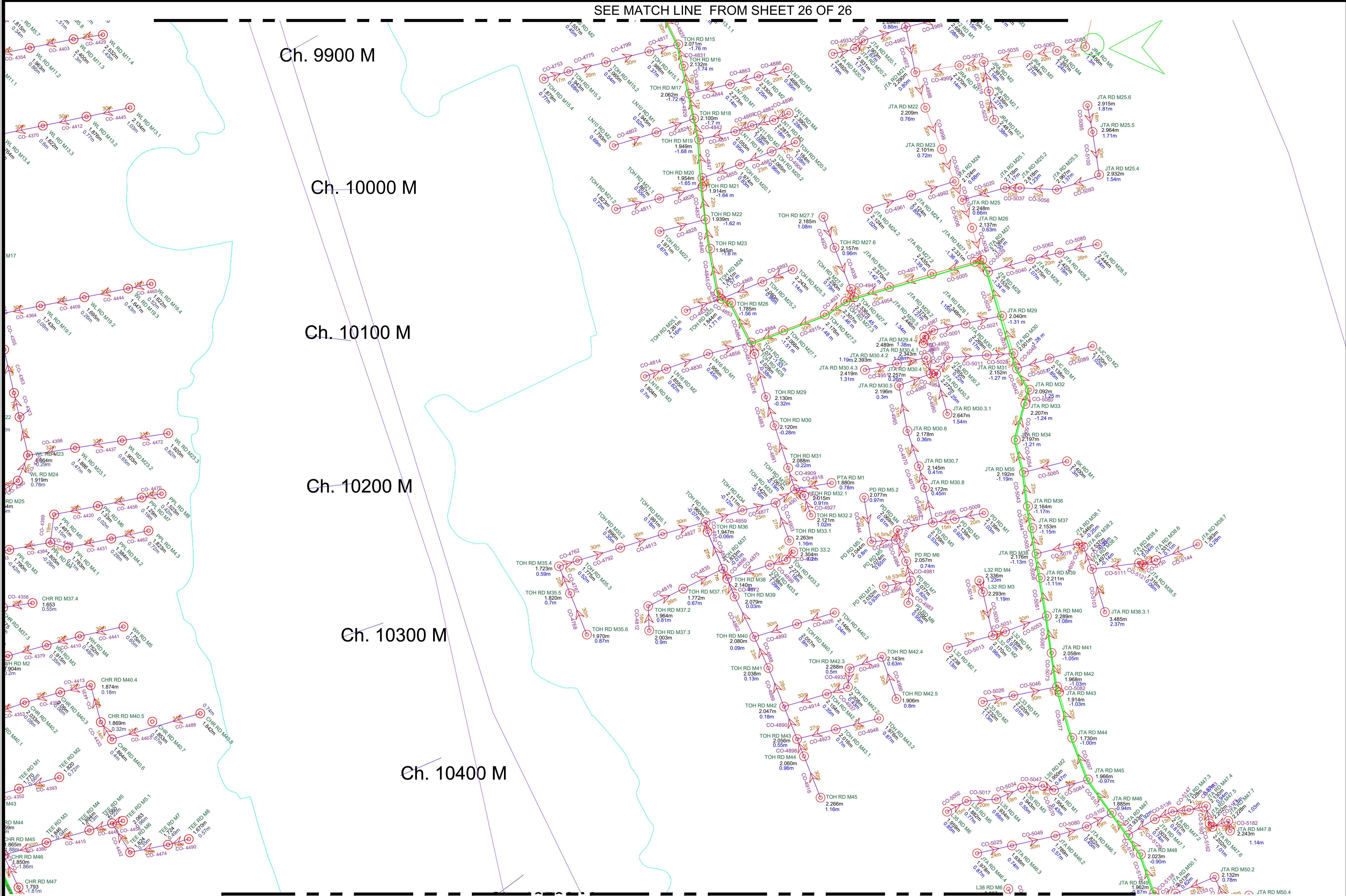


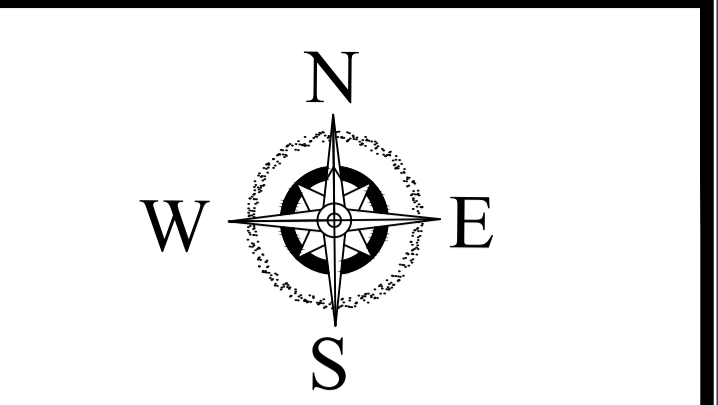
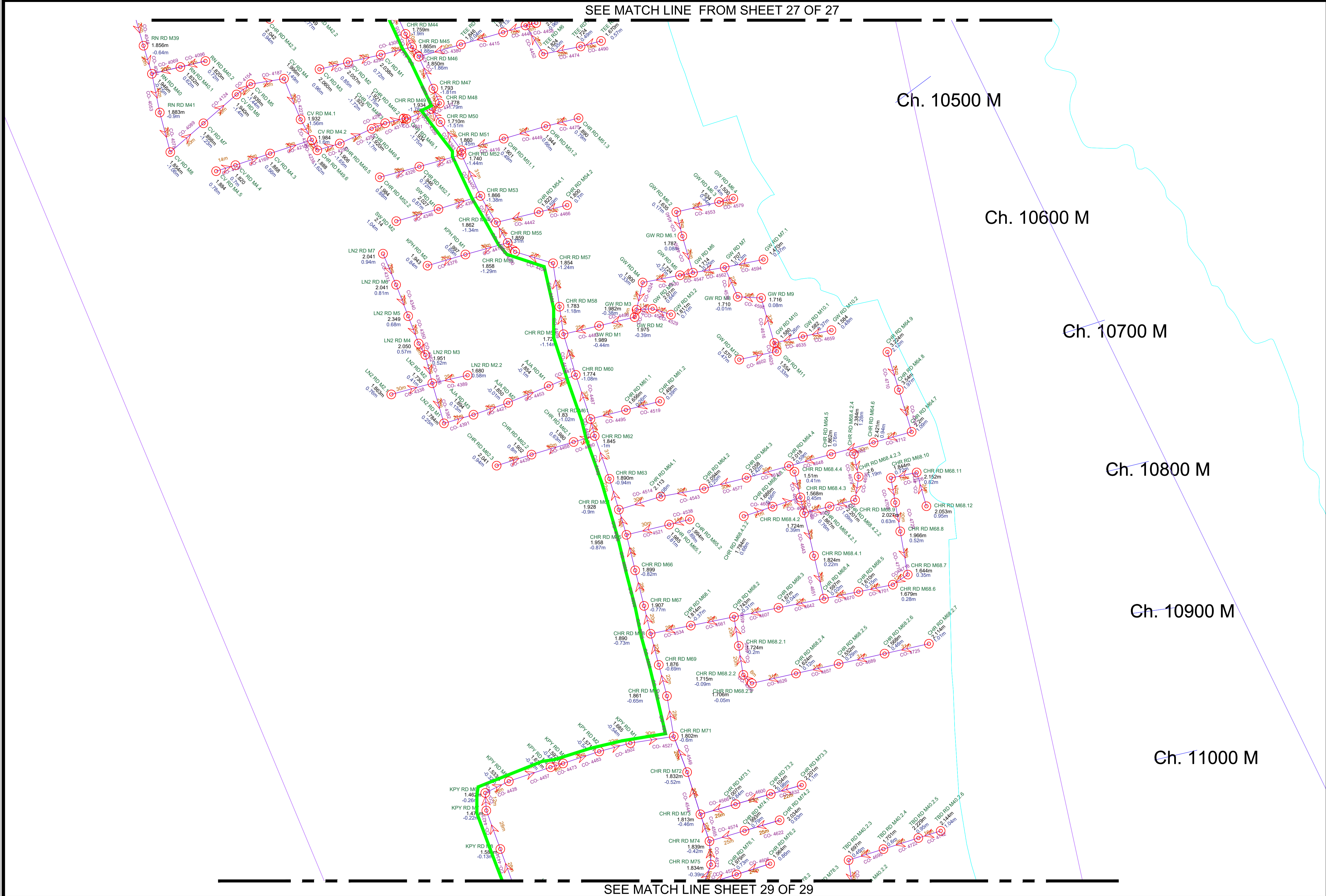
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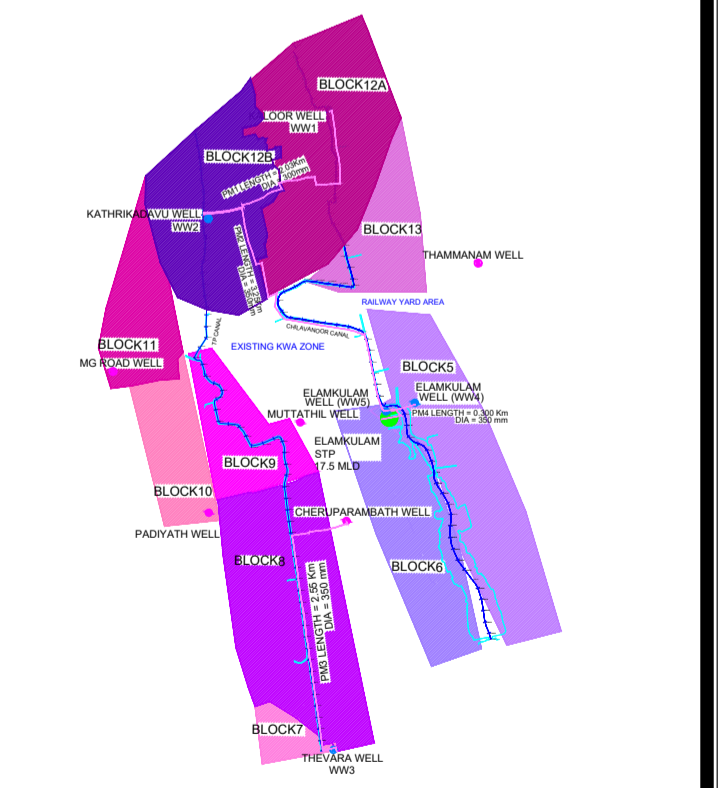





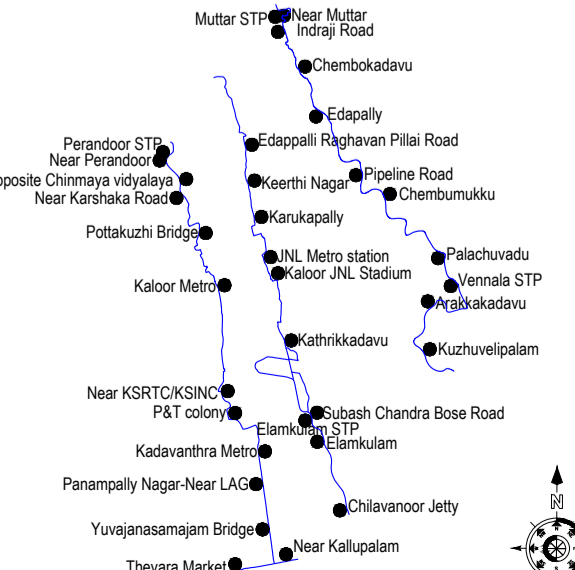


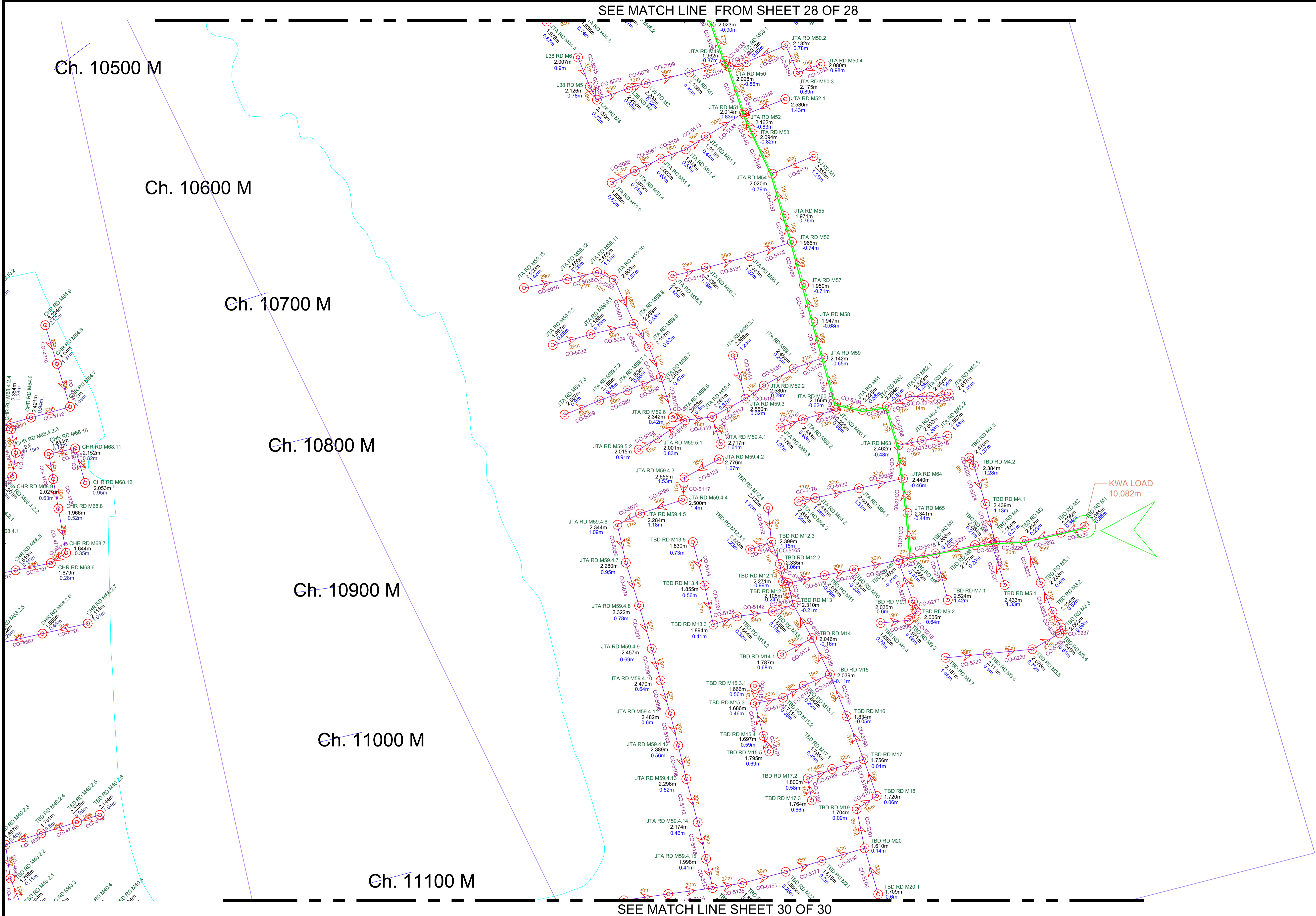
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- PROPOSED STP AREA, ELAMKULAM 17.5 MLD

KEY PLAN



<div>CLIENT:</div> <div></div> <div>KOCHI METRO RAIL LIMITED</div> <div>GENERAL CONSULTANT:</div> <div></div> <div>Antea Nederland B.V and Antea India (JV)</div>		<div>PROJECT:</div> <div></div> <div>Integrated Urban Regeneration & Water Transport System</div>		<table><tr><th></th><th>NAME</th><th>SIGN</th><th>DATE</th></tr><tr><td>DRAWN</td><td>RAHUL DILIP SEENU ALEX PHILIP GEOPHY</td><td>RD SA PG</td><td>30/11/2022</td></tr><tr><td>DESIGNED</td><td>RESHMA R DIVYA ROSE M</td><td>RR DR</td><td>25/11/2022</td></tr><tr><td>CHECKED</td><td>RENUKA MENON</td><td>RM</td><td>26/11/2022</td></tr><tr><td>APPROVED</td><td>RENUKA MENON</td><td>RM</td><td>26/11/2022</td></tr></table>		NAME	SIGN	DATE	DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	30/11/2022	DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/11/2022	CHECKED	RENUKA MENON	RM	26/11/2022	APPROVED	RENUKA MENON	RM	26/11/2022	<div>KEY PLAN:</div> <div></div>	<table><tr><th colspan="2">NO OBJECTION BY KMRL :</th></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td></tr></table>	NO OBJECTION BY KMRL :																																																																																																																																																																																																																						
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W

N

E

S

LEGEND

200mm Dia PIPE

250mm Dia PIPE

400mm Dia PIPE

450mm Dia PIPE

500mm Dia PIPE

560mm Dia PIPE

630mm Dia PIPE

PUMPING MAIN

TRUNK MAIN

TEXT

MANHOLE ID

TEXT

INVERT LEVEL

TEXT

MANHOLE ELEVATION

MANHOLES

FLOW DIRECTION



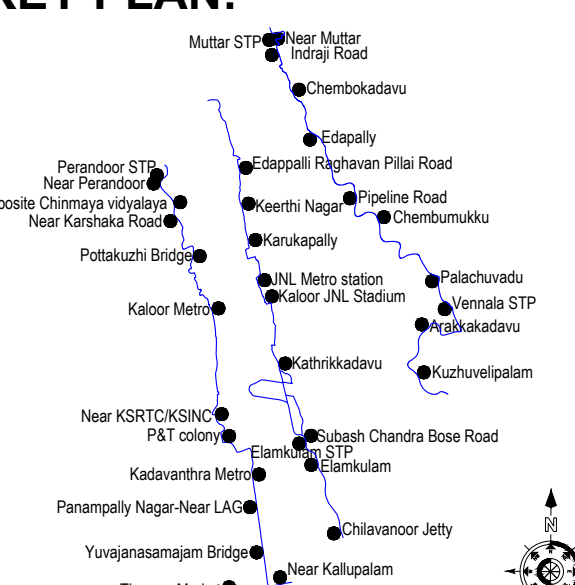

LIFTING MANHOLES

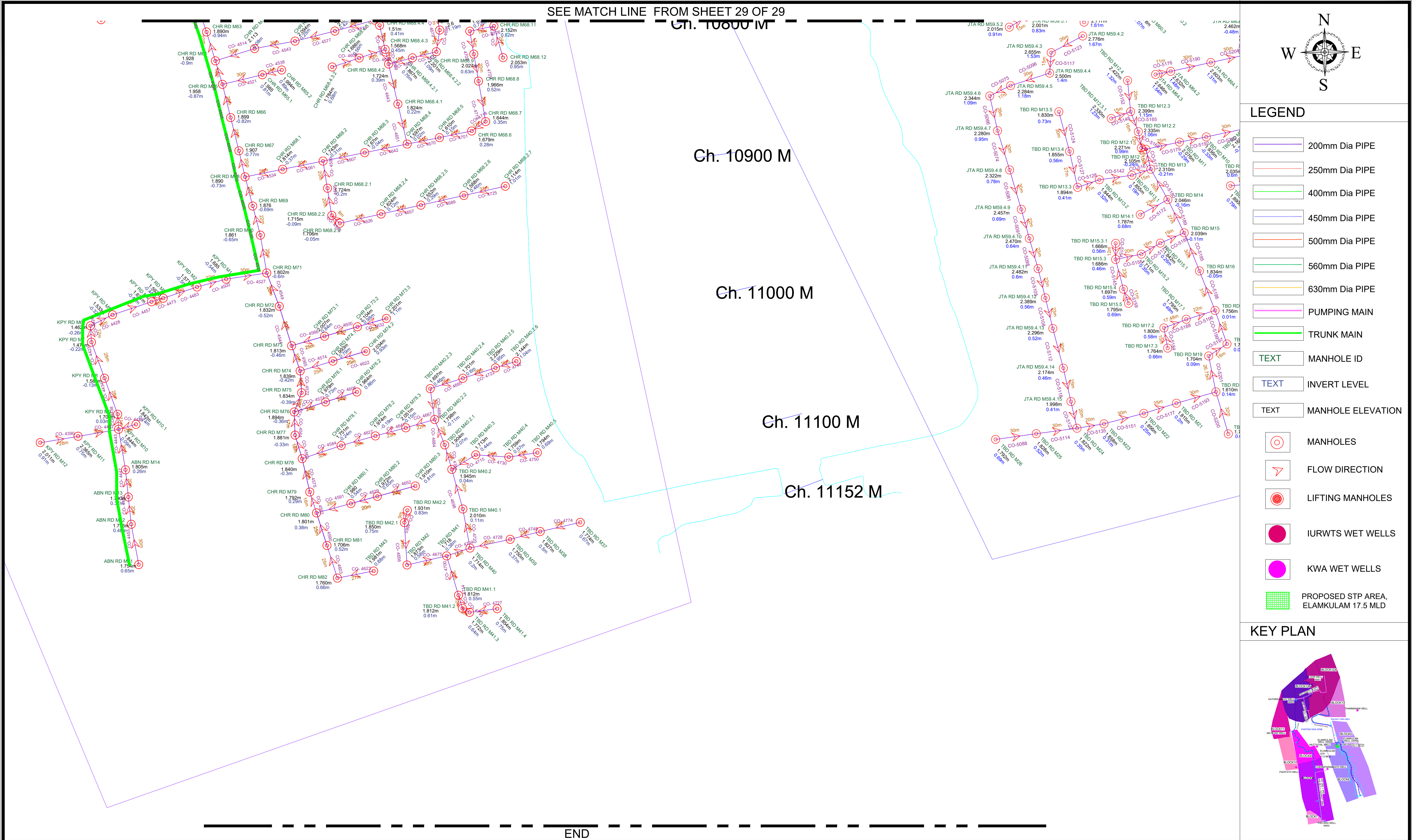
IURWTS WET WELLS




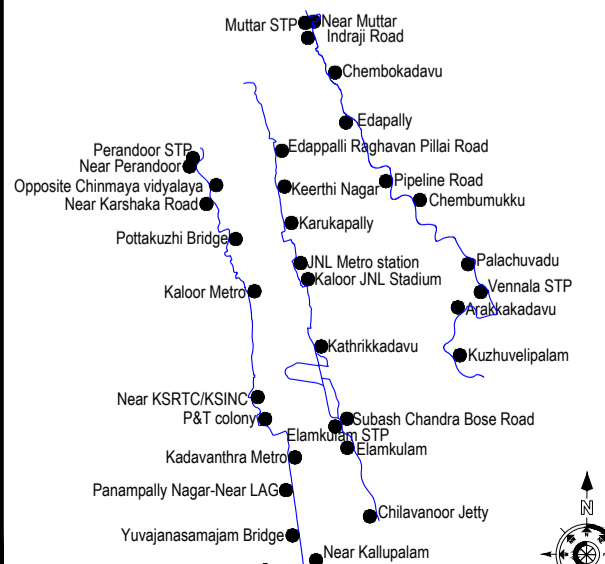
KWA WET WELLS

PROPOSED STP AREA,
ELAMKULAM 17.5 MLD

KEY PLAN

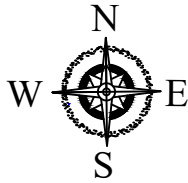
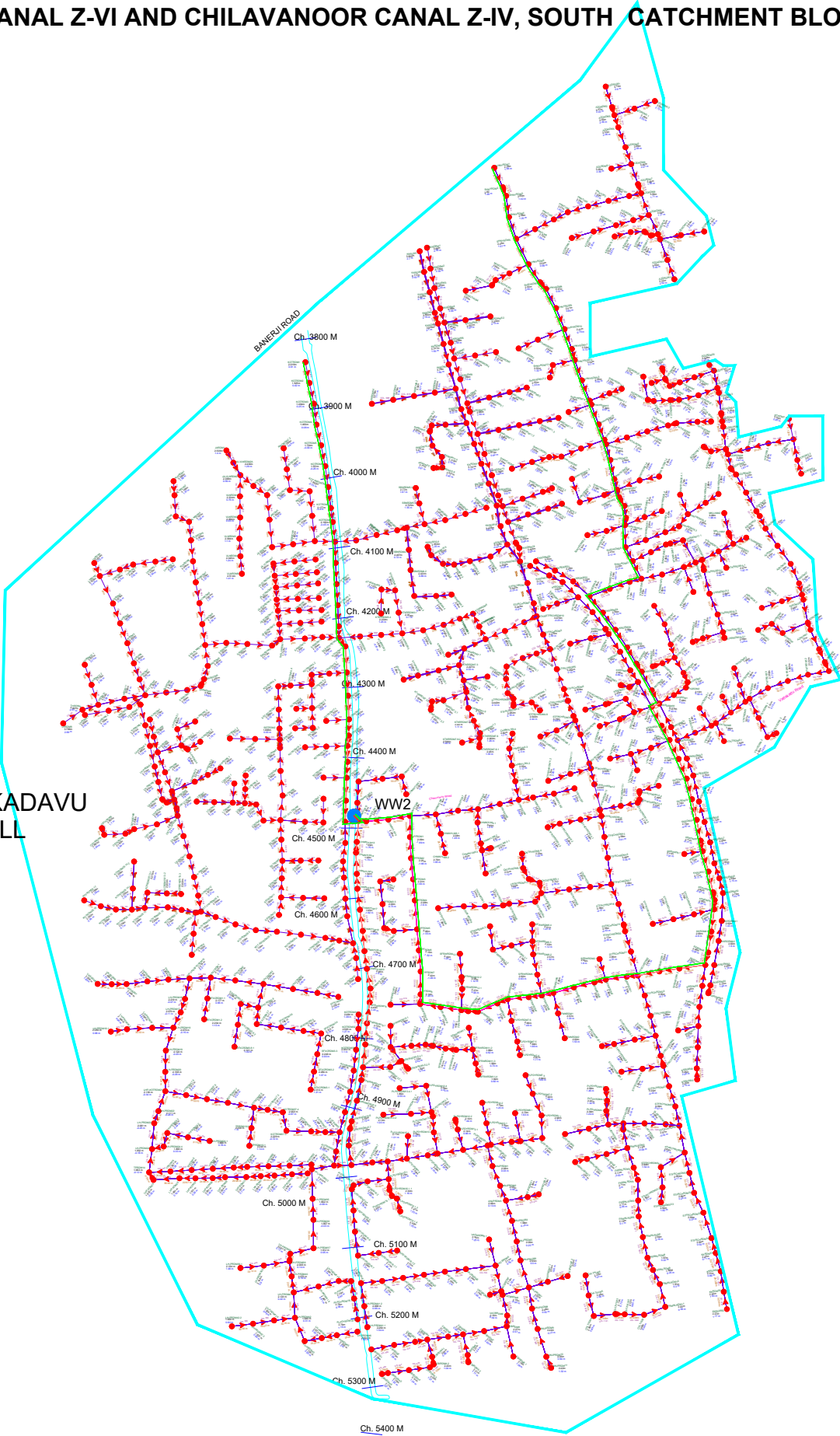
CLIENT:  KOCHI METRO RAIL LIMITED		PROJECT:  Integrated Urban Regeneration & Water Transport System		NAME		SIGN	DATE	KEY PLAN: 		NO OBJECTION BY KMRL :		REVISIONS:			NAME OF PROJECT : INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM						
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		CHECKED		RENUKA MENON	RM		26/11/2022	APPROVED		RENUKA MENON	RM	26/11/2022	R0			TITLE:		DATE: 30/11/2022			
																THEVARA_PERANDOOR CANAL Z-VI AND CHILAVANNOOR CANAL Z-IV, SOUTH CATCHMENT SEWER NETWORK TENTATIVE FLOW DIAGRAM		REV.: R4			
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																DRG. NO : IURWTS-WT2024-CH-CIVIL-1834		SHEET: 30 OF 31			
																DIMENSIONS: in MTS					



<div>CLIENT:</div> <div></div> <div>KOCHI METRO RAIL LIMITED</div> <div>GENERAL CONSULTANT:</div> <div></div> <div>Antea Nederland B.V and Antea India (JV)</div>		<div>PROJECT:</div> <div></div> <div>Integrated Urban Regeneration & Water Transport System</div>	<table><tr><td></td><td>NAME</td><td>SIGN</td><td>DATE</td></tr><tr><td>DRAWN</td><td>RAHUL DILIP SEENU ALEX PHILIP GEOPHY</td><td>RD SA PG</td><td>30/11/2022</td></tr><tr><td>DESIGNED</td><td>RESHMA R DIVYA ROSE M</td><td>RR DR</td><td>25/11/2022</td></tr><tr><td>CHECKED</td><td>RENUKA MENON</td><td>RM</td><td>26/11/2022</td></tr><tr><td>APPROVED</td><td>RENUKA MENON</td><td>RM</td><td>26/11/2022</td></tr></table>		NAME	SIGN	DATE	DRAWN	RAHUL DILIP SEENU ALEX PHILIP GEOPHY	RD SA PG	30/11/2022	DESIGNED	RESHMA R DIVYA ROSE M	RR DR	25/11/2022	CHECKED	RENUKA MENON	RM	26/11/2022	APPROVED	RENUKA MENON	RM	26/11/2022	<div>KEY PLAN:</div> <div></div>	<table><tr><td colspan="2">NO OBJECTION BY KMRL :</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	NO OBJECTION BY KMRL :																																																																																																																																																																					
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THEVARA_PERANDOOR CANAL Z-VI AND CHILAVANOOR CANAL Z-IV, SOUTH CATCHMENT BLOCK-12B SEWER NETWORK TENTATIVE FLOW DIAGRAM

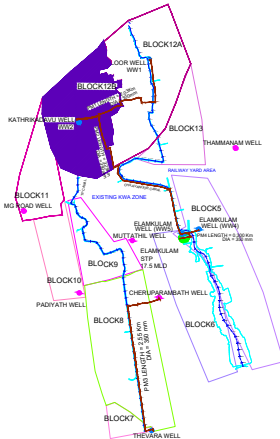
KATHRIKADAVU
WELL



LEGEND

- 200mm Dia PIPE
- 250mm Dia PIPE
- 300mm Dia PIPE
- PUMPING MAIN
- TRUNK MAIN
- TEXT MANHOLE/WET WELL ID
- TEXT INVERT LEVEL
- TEXT MANHOLE ELEVATION
- MANHOLES
- FLOW DIRECTION
- LIFTING MANHOLES
- IURWTS WET WELLS
- PROPOSED STP AREA, ELAMKULAM 17.5MLD

KEY PLAN



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MANHOLE ID <small>(ONLY TO SHOW THE DIRECTION OF PUMPING MAIN)</small>	P37	P38	P39	P40	P41	P42	P43	P44	P45	P46	P47	P48	P49	P50	P51	P52	P53	P54
GROUND ELEVATION	0.210 m	0.200 m	0.200 m	0.190 m	0.180 m	0.180 m	0.170 m	0.170 m	0.160 m	0.160 m	0.150 m	0.140 m	0.140 m	0.130 m	0.120 m	0.120 m	0.110 m	0.110 m
INVERT LEVEL	-1.090 m	-1.100 m	-1.100 m	-1.110 m	-1.120 m	-1.120 m	-1.130 m	-1.130 m	-1.140 m	-1.140 m	-1.150 m	-1.160 m	-1.160 m	-1.170 m	-1.180 m	-1.180 m	-1.190 m	-1.190 m
LENGTH	30.00 m	30.00 m	23.40 m	30.00 m	30.00 m	30.00 m	30.00 m	30.00 m	23.46 m	30.00 m	30.00 m	30.00 m	30.00 m	30.00 m	30.00 m	30.00 m	30.00 m	30.00 m


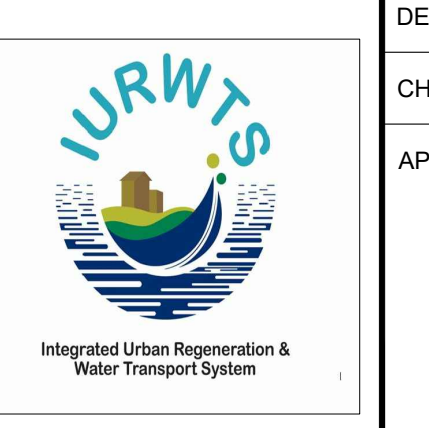
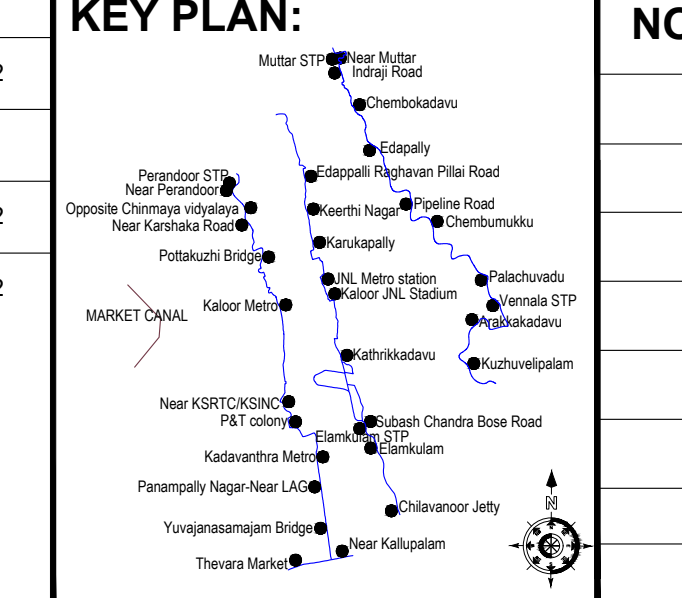




1000 m

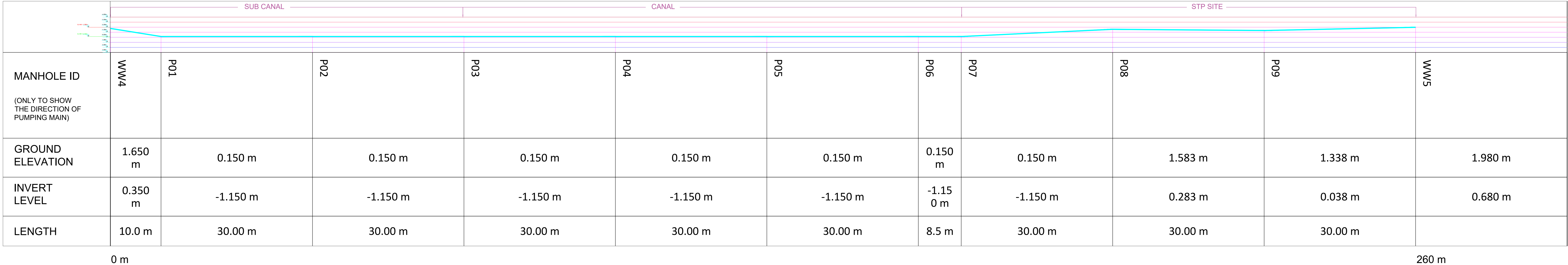
1500 m

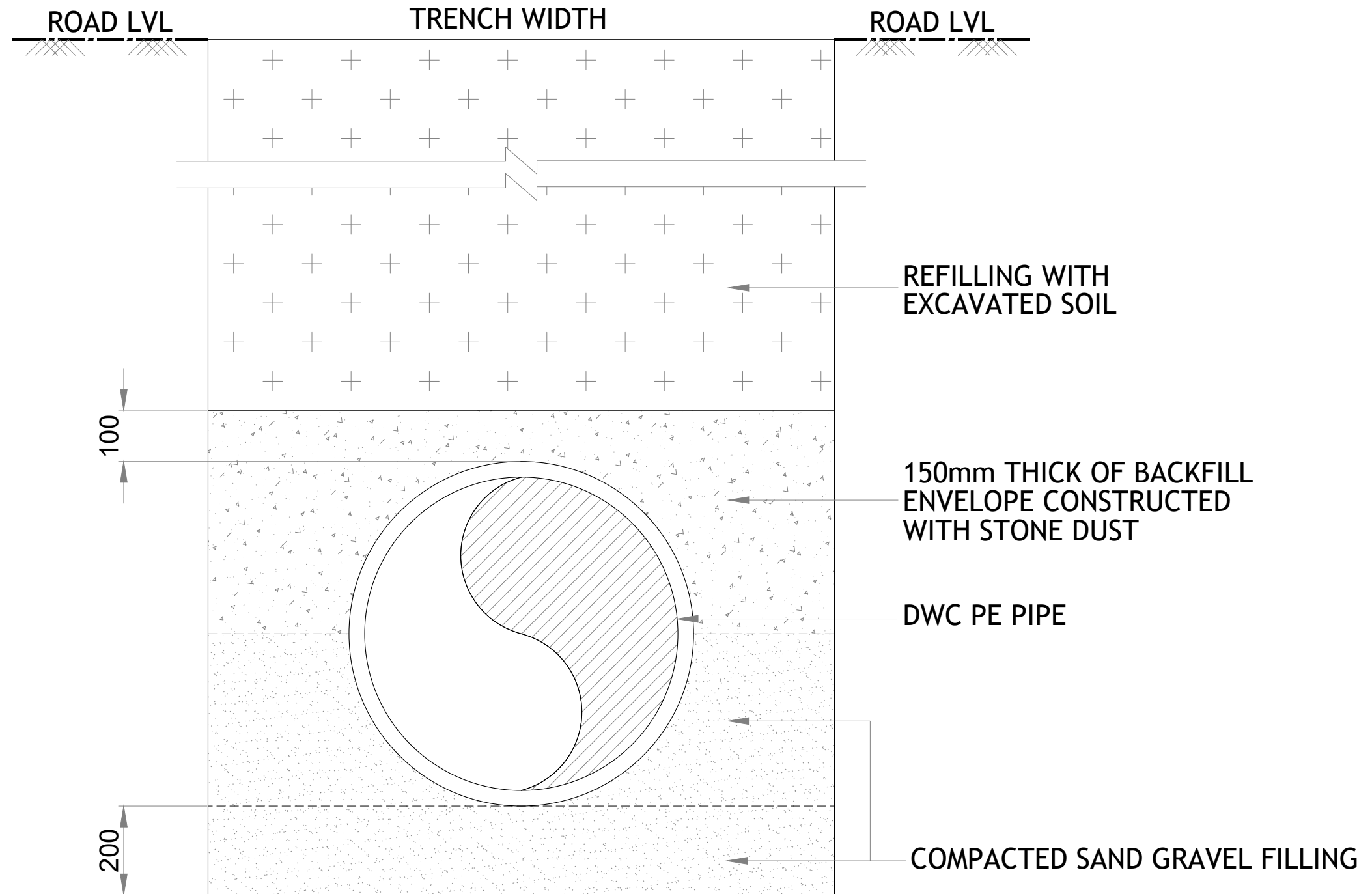
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MANHOLE ID <small>(ONLY TO SHOW THE DIRECTION OF PUMPING MAIN)</small>	P54	P55	P56	P57	P58	P59	P60	P61	P62	P63	P64	P65	P66	P67	P68	P69	P5CR RD M14	GNC-8CR RD M1
GROUND ELEVATION	0.110 m	0.100 m	0.095 m	0.090 m	0.080 m	0.075 m	0.070 m	0.060 m	0.060 m	0.050 m	0.045 m	0.040 m	0.030 m	0.030 m	0.020 m	0.010 m	2.130 m	2.282 m
INVERT LEVEL	-1.190 m	-1.200 m	-1.205 m	-1.210 m	-1.220 m	-1.225 m	-1.230 m	-1.240 m	-1.240 m	-1.250 m	-1.255 m	-1.260 m	-1.270 m	-1.270 m	-1.280 m	-1.290 m	0.830 m	0.982 m
LENGTH	30.00 m	30.00 m	30.00 m	30.00 m	30.00 m	30.00 m	30.00 m	30.00 m	30.00 m	30.00 m	30.00 m	30.00 m	30.00 m	30.00 m	30.00 m	22.36 m	30.00 m	30.00 m

1500 m





2000 m

CLIENT:  KOCHI METRO RAIL LIMITED		PROJECT:  Integrated Urban Regeneration & Water Transport System		NAME PHILIP SIGN PGP DATE 10-11-2022	KEY PLAN: 	NO OBJECTION BY KMRL : <table><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table>															LEGENDS: GROUND PROFILE -  PUMPING MAIN -  AIR VALVE -  SCOUR VALVE - 		REVISIONS: <table><tr><th>NO.</th><th>DESCRIPTION</th><th>DATE</th><th>BY</th></tr><tr><td> </td><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td><td> </td></tr></table>		NO.	DESCRIPTION	DATE	BY													NAME OF PROJECT : INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM LOCATION: ELAMKULAM, KOCHI TITLE: PROPOSED PUMPING MAIN PROFILE WITH GROUND ELEVATION LONGITUDINAL SECTION OF PM3 350mm THEVARA WELL (WW3) TO CHERUPARABATH WELL (KWA) DRG. NO : IUR
NO.	DESCRIPTION	DATE	BY																																						





CROSS SECTION OF PIPE BEDDING FOR DWC PIPE

<div>CLIENT:</div> <div></div> <div>KOCHI METRO RAIL LIMITED</div> <div>GENERAL CONSULTANT:</div> <div></div> <div>Antea Nederland B.V and Antea India (JV)</div>	<div>PROJECT:</div> <div></div> <div>Integrated Urban Regeneration & Water Transport System</div>		NAME	SIGN	DATE	<div>KEY PLAN:</div> 	NO OBJECTION BY KMRL :				REVISIONS:				NAME OF PROJECT : INTEGRATED URBAN REGENERATION & WATER TRANSPORT SYSTEM			
		DRAWN	THAJUDEEN	TS	24/09/2022										LOCATION: KOCHI		SCALE: NTS	
		DESIGNED	RENUKA M	RM	24/09/2022										TITLE: TYPICAL DETAILS FOR PIPE BEDDING		DATE: 24/09/2022	
		CHECKED																

ANNEXURE 6

DESIGN : STP

Consultant:



ANNEXURE 6
DESIGN AND DRAWINGS : STP

Project:

IURWTS

Client:



**DESIGN OF SEWAGE WET WELLS, PUMPING MAIN & PUMP
ELAMKULAM STP-From Wet Well@STP to IC@STP**

Note:

(ref: CPHEEO Manual-4.20-Sewage pumping main are designed water pumping mains. The exception being that the design practice of economical size of pumping mains in conjunction with the electrical energy of the pump sets as used in water pumping mains is not applicable in sewage pumping mains. This is due to varying rates of discharge through the 24 hours like low, average and peak flows through the same main at various parts of the day and night.

During execution the total head for pumpsets should be calculated considering the wastage due to valves and specials actually used.

In the design 10% of the friction loss is included as minor loss to take care of this.

Basic Data

Wet Well Location and other Details

Block No.	TM ends at	IL at the end of TM as per SNW Design	Ult.Peak Flow as per SNW Design. (lps)	Pumping main					
				From	To	Length m	Flow ult.peak flow (3 DWF)	GL	
								From	To
12A	WW1	-0.83	80.15	WW1	WW2	2030	80.15	2.44	1.59
12B	WW2	-2.16	78.311	WW2	IC@STP	3500	158.461	1.59	1.98
6	WW5 @STP	-2.1	21.534	WW5	IC@STP	30	21.534	1.98	1.98
5	WW4	-3.19	169.023	WW4	IC@STP	300	169.023	1.65	1.98

Pumping main from WW5 to IC@STP

Ultimate peak flow 21.53 lps

Flow in MLD

Stage	Year	Flow in MLD
Initial	2025	1.56
Intermediate	2040	1.71
Ultimate	2055	1.86

Length of Pumping Main	30.00	m
Top level of Inlet chamber	7.98	m
Hours of pumping	24.00	hrs
Residual Head	2.00	m
FOOT VALVE LEVEL	-4.71	m
Static head including Residual Head	14.69	m

RESULTS

SEWAGE QUANTITY

Discharge (3 DWF)

Stage	Year	Discharge			Referenc e to ECP sheet	ECP design output		Proposed Combination			Velocity		
		MLD	lpm	lps		Pipe size and type	Pumpset Capacity (HP) (Intermediat e)	Pipe size and type	Pumpset Capacity (HP) (Base year to Intermediat e)	Pumpset Capacity (HP) (Inter. To Ultimate)	Inter.	Ult	
							Available		Available	Available			
Initial	2025	1.56	1083	18.06	ECP-3-DWF	200 DI K9	10.00	150 DI K9	10.00	10.00	1.12	1.22	
Intermediate	2040	1.71	1188	19.79									
Ultimate	2055	1.86	1292	21.53									

Discharge (2 DWF)

Stage	Year	Discharge			Referenc e to ECP sheet	ECP design output		Proposed Combination			Velocity		
		MLD	lpm	lps		Pipe size and type	Pumpset Capacity (HP) (Intermediat e)	Pipe size and type	Pumpset Capacity (HP) (Base year to Intermediat e)	Pumpset Capacity (HP) (Inter. To Ultimate)	Inter.	Ult	
							Available		Available	Available			
Initial	2025	1.04	722	12.04	ECP-2-DWF	150 DI K9	5.00	150 DI K9	5.00	5.00	0.75	0.	

Discharge (1 DWF)

PROVIDE PUMPING MAIN OF 150 DI K9 SIZE

RESULTS

Size of main 150 DI K9

PUMPSETS

During the period from 2025 to 2040 (considering 15 years as life)

CHECK

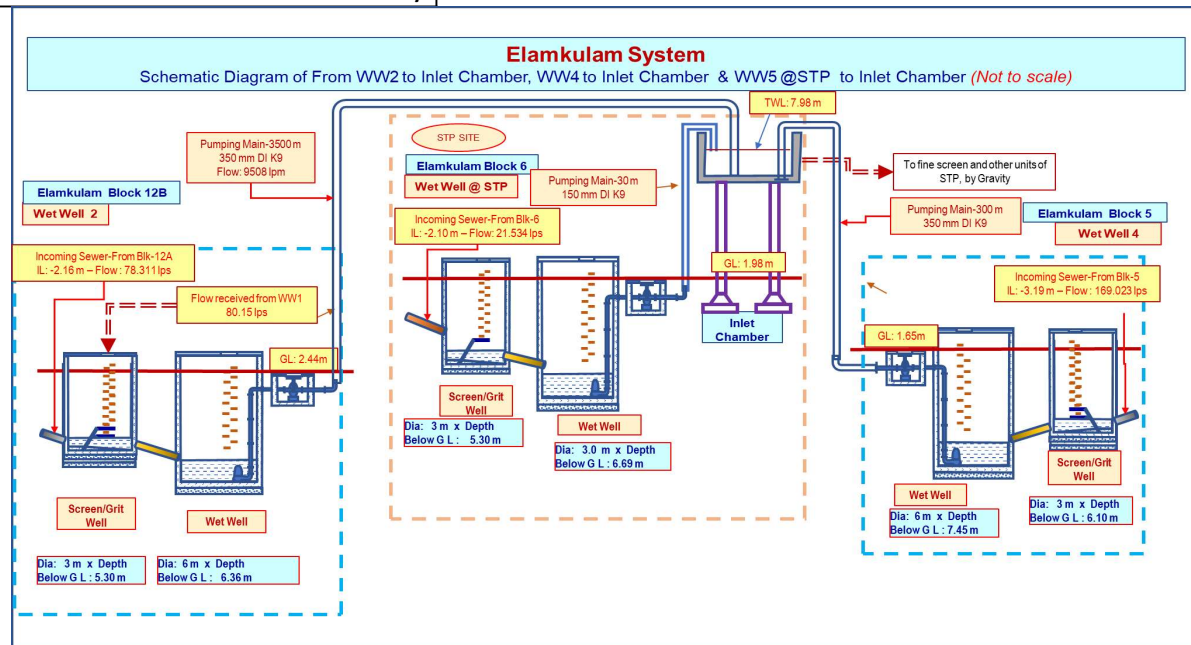
Provide	5 HP x	1 NO.	5	10
Provide	5 HP x	1 NO.	5	
Standby	5 HP x	1 NO.		
PUMP SET OPERATING PLAN (Tentative)				
Lean pe	5 HP x	1 NO.	5	5.00
Lean pe	0 HP x	1 NO.	0	
Ave, flow	5 HP x	1 NO.	5	5.00
+	0 HP x	1 NO.	0	
Peak, flow	5 HP x	2 NO.	10	10.00
+	0 HP x	1 NO.	0	

During the period from 2040 to 2055 (considering 15 years as life of pumpset)

Provide	5 HP x	1 NO.	5	10
Provide	5 HP x	1 NO.	5	
Standby	5 HP x	1 NO.		
PUMP SET OPERATING PLAN (Tentative)				
Lean pe	5 HP x	1 NO.	5	5.00
Lean pe	0 HP x	1 NO.	0	
Ave, flo	5 HP x	1 NO.	5	5.00
+	0 HP x	1 NO.	0	
Peak, flt	5 HP x	1 NO.	5	10.00
Peak, flt	5 HP x	1 NO.	5	

For Estimate of pump sets propose (Intermediate)

5 HP x 1 No. + 5 HP x 1 No. + 5 HP x 1 No. Standby

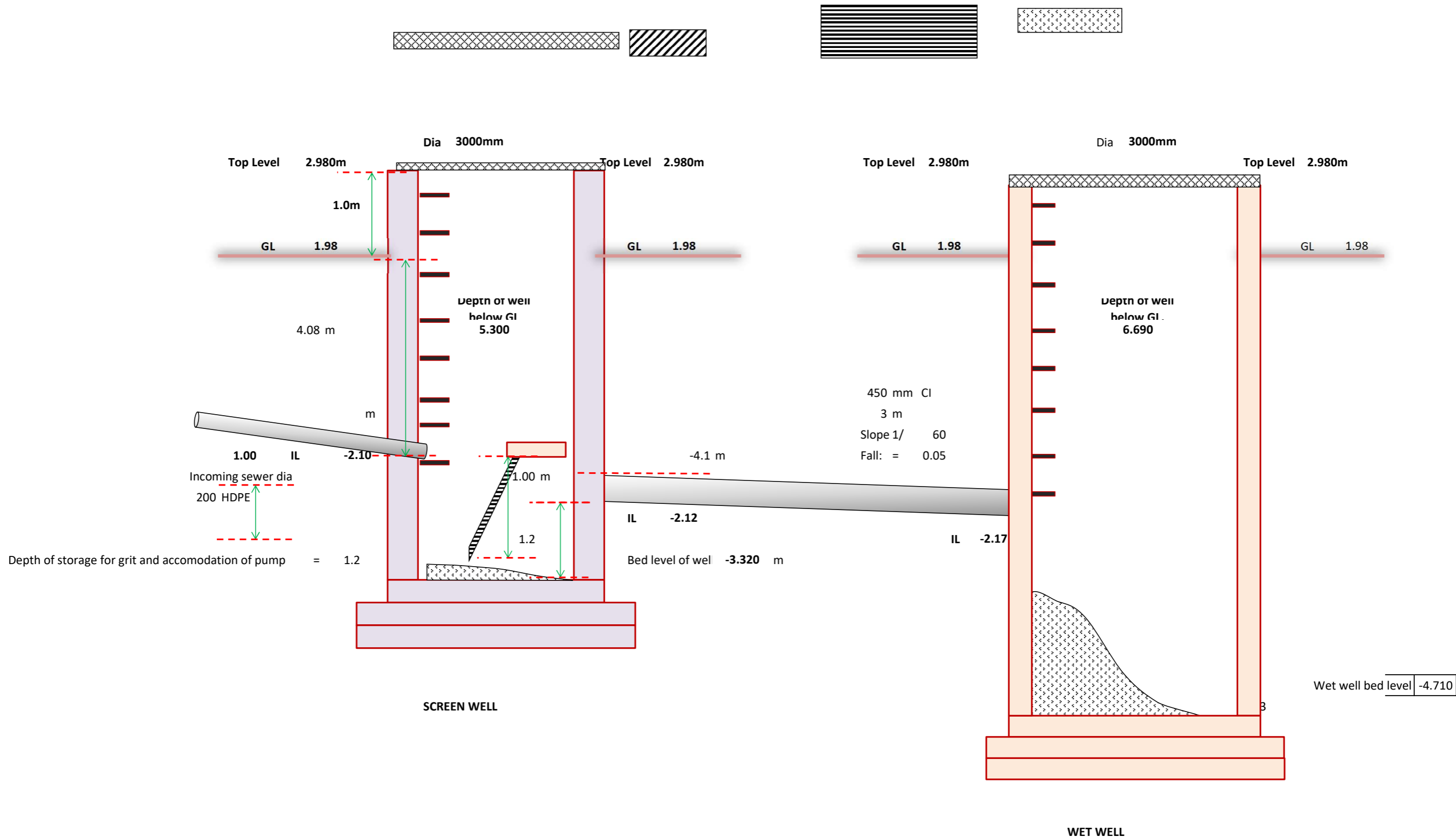


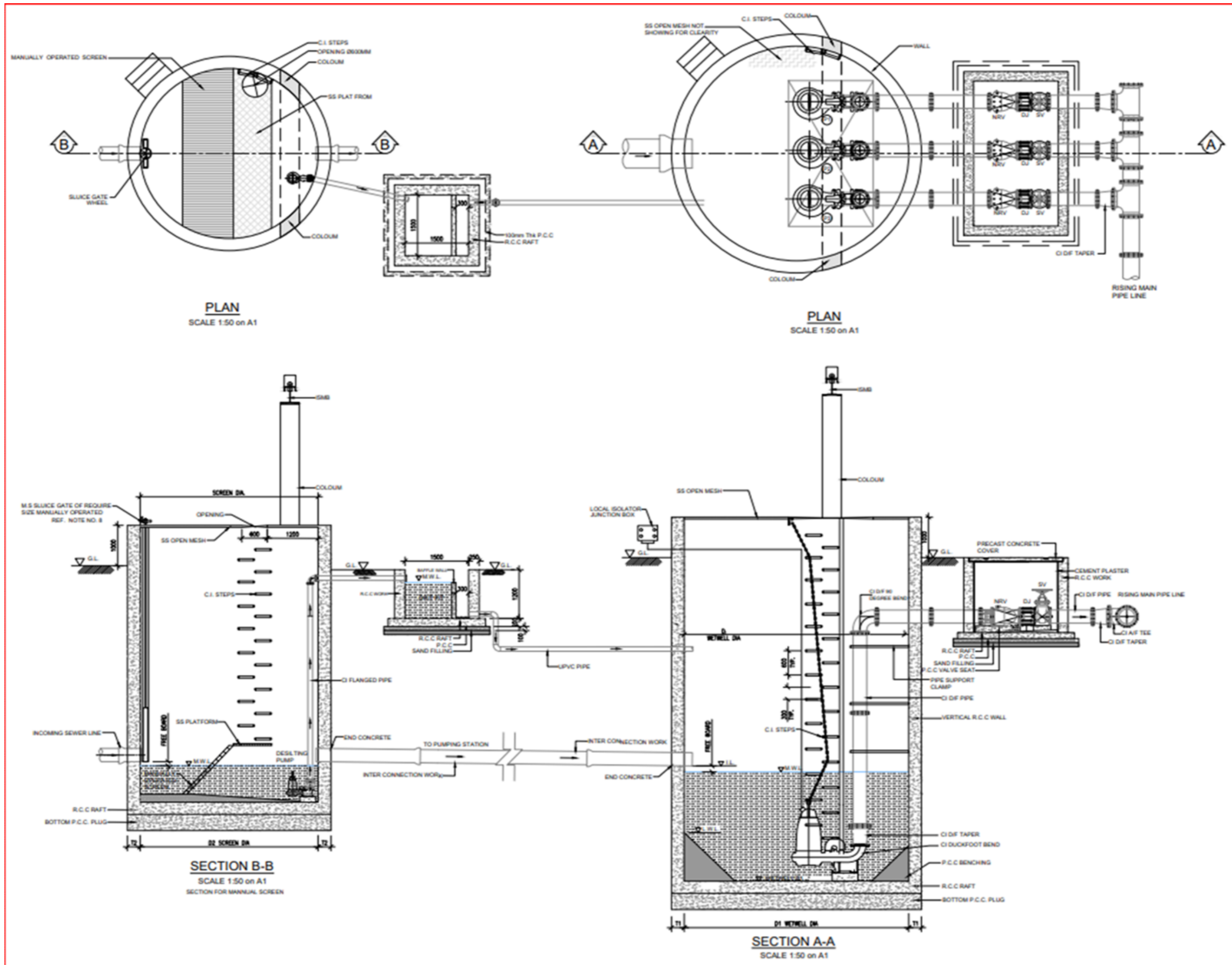
ELAMKULAM STP-From Wet Well@STP to IC@STP			
Design/Input Data			
Sr. No.	Description	Values	Unit
Input values			
1	Average Flow	1.56	MLD
2	Intermediate Flow	1.71	MLD
3	Peak Flow	1.86	MLD
4	GL at STP site	1.98	m
5	IL of Incoming Sewer	-2.10	m
6	Length of Rising Main	30.00	m
7	TWL of Inlet chamber at STP	7.98	m
8	Dia of incoming sewer	0.20	m
9	d/D of incoming sewer	0.62	
10	Velocity in sewer at peak design Ultimate flow	0.78	m/s
11	Residual Head	2.00	m
Output values			
1	Average Flow	65.00	m ³ /hr
2	Peak Flow	77.50	m ³ /hr
3	Suction Depth (Depth of SPS)	6.69	m

ELAMKULAM STP-From Wet Well@STP to IC@STP			
Diameter required for Screen/Grit well			
Data			
Average Flow	1.560	MLD	
Peak Design Flow	1.860	MLD	
	0.022	m ³ /s	0.022
Inner Dia of incoming sewer	0.200	m	OD: 0.10
d/D	0.620		
Depth of flow in sewer at peak flow	0.124	m	0.2
Velocity in sewer at peak design Ultimate flow	0.780	m/s	
Drop of screen chamber floor to invert	0.080	m	
G.L of Screen well	1.980	m	
I.L of Screen Well	-2.100	m	
Assumed width of bars	10	mm	
Clear spacing between bars	25	mm	
Design of Bar Rack (Screen)			
Type of Screening		Manual	
Assume Velocity through screen	0.7	m/s	0.7
Clear area of openings through the rack	0.031	m ²	0.031
Clear width of openings through the rack	0.248	m	0.154
Number of clear spacings	10.000		
So number of bars	9.000		
Total width of the Screen	0.300	m	
Projected fixtures width each side	0.150	m	
Total width of the Screen	0.600	m	
Angle of Inclination of Bar	45 °		
→Angle of Inclination should be 75 °-85° in Mechanically Cleaned and 45° in Manually			
Height above G.L	1.000	m	
Total depth of Bar Rack	1.000	m	
Sin 45°	0.707		
Slant height of Screen	1.500	m	
Tan 45°	1.000		
Horizontal length of Screen	1.000		
Length between pipe and screen	0.600	m	
Length between screen and Effluent pipe(To accommodate grit pump & operating platform)	1.500	m	
Total Length of the chamber	3.000	m	
Providing Manual Screen of Size 0.6 m Width X 1.5 m Height			
Providing well internal diameter of Screen/Grit Well 3 m			

Diameter required for Screen/Grit well			
hence, take maximum,	0.15	=	$0.15 \times 1000 \text{ m}^3 / \text{Mm}^3$
		=	150 m^3 / Mm^3
This quantity is for 24 hrs, hence, per hour flow		=	$150 / 24$
		=	6.25 m^3 / mm^3
The quantity increases 3 to 4 times during peak		=	3.5×6.25
Taking average, 3.5		=	$21.875 \text{ m}^3 / \text{mm}^3$
This quantity lasts for 2 to 3 hours in Morning and evening		=	3
Hence, taking the maximum hours of		=	$65.625 \text{ m}^3 / \text{mm}^3$
Volume = 3 x 21.88		=	6.250×5
For 5 hours of normal flow =		=	$31.250 \text{ m}^3 / \text{mm}^3$
		=	$96.875 \text{ m}^3 / \text{mm}^3$
Therefore for total / day		=	$1292 \times 60 \times 24 \times 10^6$
Volume of grit collected / day		=	96.88
		=	0.180 cu.m
Volume of Storage required		=	0.180 cu.m
Assuming dia of well as		=	3.00 m
Area of well		=	7.069 sq.m
Depth of Storage required		=	0.025 m
Total depth of Bar Rack		=	1.000
Total depth requird.		=	1.025
Provide a minimum depth of		=	1.20 Min. 1.20 m to accor
Check:			
Volume provided		=	$22 \times 3 \times 3 \times 1.2 \times 2$
		=	7×4
		=	5.660 cu.m
No. of days		=	$5.660 / 0.18$
		=	31.404 days
Depth of Grit well			
G.L		=	1.980 m
I.L of incoming pipe		=	-2.100 m
Depth of storage for grit and accomodation of pump			

ELAMKULAM STP-From Wet Well@STP to IC@STP				
Design/Input Data				
Wet Well Calculations				
Sr. No.	Description	Unit	Value	Remark
Basic details				
1	Peak Flow	m ³ /hr	77.500	
wet well design				
1	Time for one pump cycle for ultimate design stage	min	15.00	CPHEEP manual part A; 4.6.6
2	wet well capacity required for ultimate design stage	m ³	9.688	
3	Assumed sewage depth in wet well	m	1.500	
4	Area required for wet well	m ²	6.458	
5	Diameter required for wet well	m	2.868	
6	Diameter provided for wet well	m	3.000	
7	Actual provided wet well area	m ²	7.069	
8	Actual provided wet well capacity	m ³	10.603	
9	Ground level at wet well site	m	1.980	
10	Invert level of incoming sewer in wet well	m	-2.210	





ELAMKULAM STP-From Wet Well@STP to IC@STP		
Valve Chamber		
Length	1.50	m
Breadth	3.40	m
Total Depth	1.50	m
penstock depth-Grit /screen	4.50	m
penstock depth-Suction well	4.50	m
Silt Pit		
Length	1.5	m
Width	1.5	m
Depth	1.2	m

Valve Chamber*			
Dia, mm	L, m	B, m	D, m
100	1.4	3.3	1.4
150	1.5	3.4	1.5
200	1.6	3.5	1.5
250	1.8	3.5	1.6
300	1.9	3.6	1.7
350	2.1	3.7	

Grit Well					
Design of Grit Well					
Depth of Grit Well	5.30	m		Total Depth(m)	6.35
Parapet Height	1.00	m		outer dia (m)	3.9
Total Height of well + Parapet	6.30	m		centre dia(m)	3.45
Dia of Grit Well	3	m		raft dia(m)	3.00
Thickness of wall	0.45	m		Screen Horizontal platform width(m)	1.5
Thickness of Raft Slab	0.45	m		Screen Mesh Opening(m)	0.6
Thickness of Plugging	0.30	m			
Design of kerb					
Diameter of grit well	3.00	m		Extra width for Excavation for working including both sides	1.2
Well wall thickness	0.45	m		Benching depth assumed	0.25
Kerb wall thickness at top	0.53	m			
Kerb wall thickness at bottom	0.15	m			</

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	14.69	1.76	0.176	16.63	2	0.2	16.89
II	14.69	0.24	0.024	14.95	0.29	0.029	15.01
III	14.69	0.06	0.006	14.76	0.07	0.007	14.77
IV	14.69	0.02	0.002	14.71	0.02	0.002	14.71
V	14.69	0.01	0.001	14.70	0.01	0.001	14.70

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	30	1289	38670
		TOTAL		38670
II	150 DI K9	30	1870	56100
		TOTAL		56100
III	200 DI K9	30	2507	75210
		TOTAL		75210
IV	250 DI K9	30	3367	101010
		TOTAL		101010
V	300 DI K9	30	4251	127530
		TOTAL		127530

DESIGN OF PUMPING MAIN FROM WET WELL TO PROPOSED STP

BASIC DATA		
GL AT Wet well site	1.980	m
Top level of receiving chamber	7.980	m
Residual Head	2.000	m
TOTAL HGL REQUIRED AT END	7.980	m
FOOT VALVE LEVEL	-4.710	m
Static head including Residual Head	14.690	m
Number of reaches	1	
Length	30	m

Combination	Pipes selected
I	100 DI K9
II	150 DI K9
III	200 DI K9
IV	250 DI K9
V	300 DI K9

ULTIMATE STAGE															
TABLE1. FRICTION LOSS															
Chainage (m)		GL	Distance (m)	Pipe			Disc. In lpm	Velocity-mps	Grade	Friction Loss	OL	TL	HGL	RH	RE

TABLE 2. TOTAL HEAD							
Combination No.	STATIC HEAD	Intermediate Stage			Ultimate stage		
		Friction loss	Other loss	Total head	Friction loss	Other loss	Total head
I	14.69	0.83	0.083	15.60	0.97	0.097	15.76
II	14.69	0.12	0.012	14.82	0.		

TABLE 6. COST OF PIPE				
Combination No.	Pipe Size and Type	Length	Rate of pipe/m	Total cost
I	100 DI K9	30	1289	38670

DESIGN OF PUMPING MAIN FROM WET WELL TO PROPOSED STP

BASIC DATA		

