

PART-2
TECHNICAL SPECIFICATION
For Design of 1 MLD CETP at
Barari, Bhagalpur

1.0 BACKGROUND OF THE PROJECT & DESIGN BASIS:

As per the direction of National Green Tribunal, BIADA has to establish a Common Effluent Treatment Plan in the Industrial Area. Study has been carried out in the year 2015-16 for the preparation of Detailed Project Report (DPR). Based on the field study, the design has been made.

The status of industries in the industrial area is tabulated in **Table-1**.

Based on the wastewater flow quantity and keeping the future projection, the design has been made for 1000 KLD.

The combined inlet wastewater characteristic is placed in **Table-2**. The desirable outlet characteristics after advance treatment is placed at **Table-3** for recycle of treated water and achieving Zero Liquid Discharge (ZLD).

TABLE-2: AVERAGE CHARACTERISTICS OF COMBINED UNTREATED EFFLUENT FOR DESIGN

<i>S. No.</i>	<i>Parameters</i>	<i>Units</i>	<i>Values</i>
1	pH value	-	6.5 ~8.5
2	Total Suspended Solids (TSS)	mg/l	350~400
3	Chemical Oxygen Demand (COD)	mg/l	1250
4	Biochemical Oxygen Demand (BOD, 3 days, 27 °C)	mg/l	500
5	Oil and Grease	mg/l	30~40
6	TDS*	mg/l	2500

*Considered for RO Inlet

Note: Re sampling (Grab Sample) has been done in the Month of Nov 2019 of the combined untreated effluent. The analysis report of relevant parameters is placed at the end of the Part-2 (Technical Specification)

TABLE-3 EXPECTED OUTLET CHARACTERISTIC OF TREATED WATER FOR RECYCLE

S. No.	Parameters	Units	Values
1	pH	-	6.8-7.2
2	Total Suspended Solids (TSS)	mg/l	Nil
3	Total Dissolved Solids(TDS)	mg/l	<250
4	Chemical Oxygen Demand (COD)	mg/l	<15

TABLE 1 DISTRIBUTION OF INDUSTRIAL CLUSTERS & WASTE WATER QUANTIFICATION IN BARARI, BHAGALPUR REGION

Industrial Group	Number of Industry	Functional	Closed	Under Construction	DWW (lit/day)	PWW (lit/day)	BOD (mg/l)	PDWW (lit/day)	PPWW (lit/day)	Plot area in sq.ft
Automobile	2	2	0	0	1,485	25,000	350	1,485	25,000	19300
Chemical	7	7	0	0	2,275	9,500	350	2,275	9,500	55900
Engineering	11	9	1	1	5,000	4,100	250	6,111	5,011	110280
Food	23	17	3	3	10,465	233,000	600	14,159	315,235	264970
Institution	7	4	0	3	37,380	-	0	65,415	-	250931
Mineral Water	4	2	1	1	1,725	10,000	100	3,450	20,000	44700
Others	13	9	2	2	4,820	7,600	250	6,962	10,978	179348
Pharmaceutical	1	0	1	0	-	-	400	-	-	7500
Plastic	8	5	1	2	1,710	-	250	2,736	-	98176
Poultry	2	1	1	0	225	1,000	500	450	2,000	7000
Printing	6	4	0	2	6,975	12,000	250	10,463	18,000	122010
Textile	9	8	0	1	6,165	48,600	500	6,936	54,675	93695
	93	68	10	15	78,225	350,800	465	120,441	460,399	
Total					429,025			580,840		1,253,810

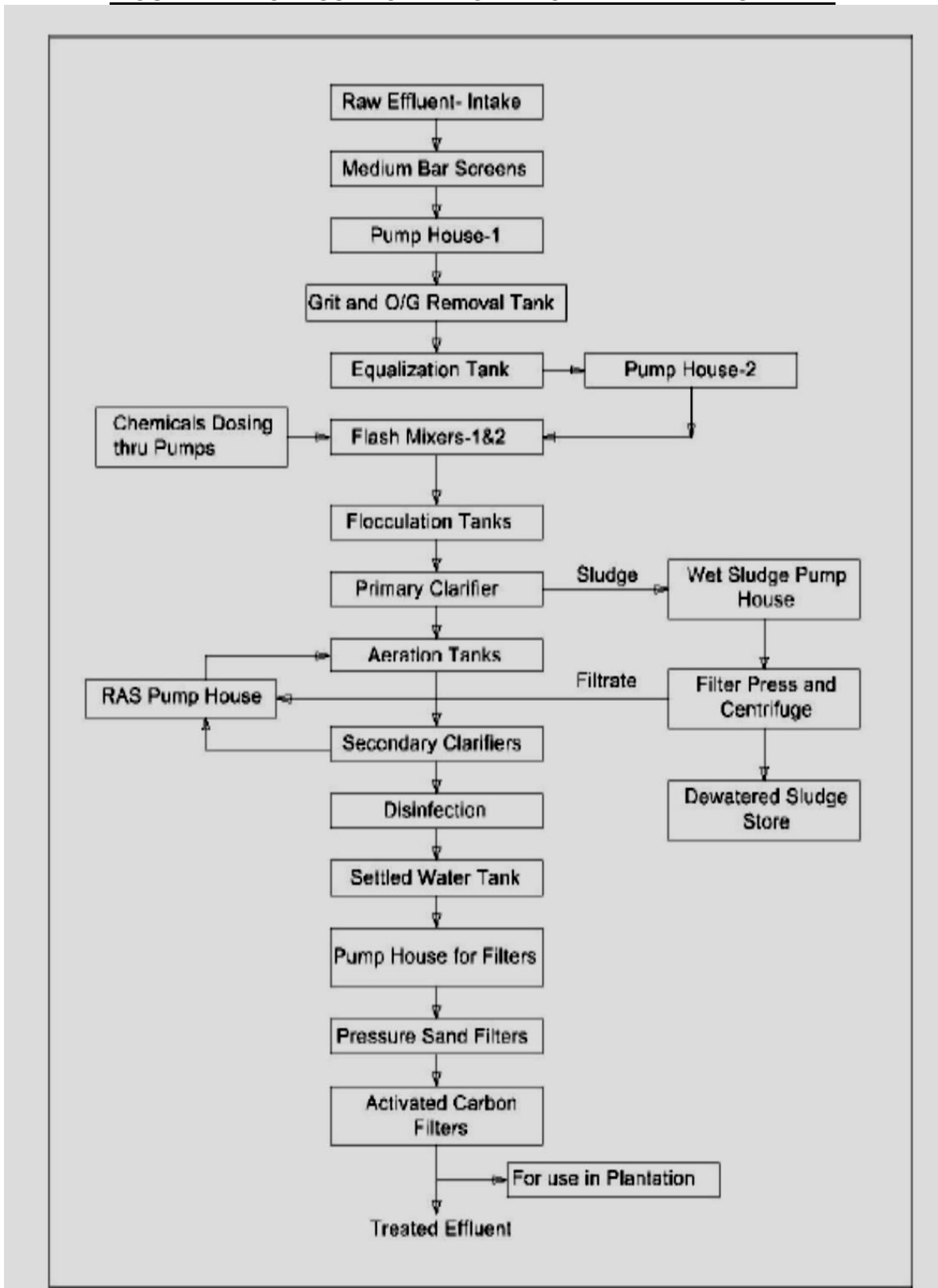
**DWW- Domestic waste water, PWW-Process waste water, PDWW- Projected Domestic Waste water, PPWW- Projected Process Waste water.*

2.0 RECOMMENDED TECHNOLOGY AND PROCESS FLOW DIAGRAM

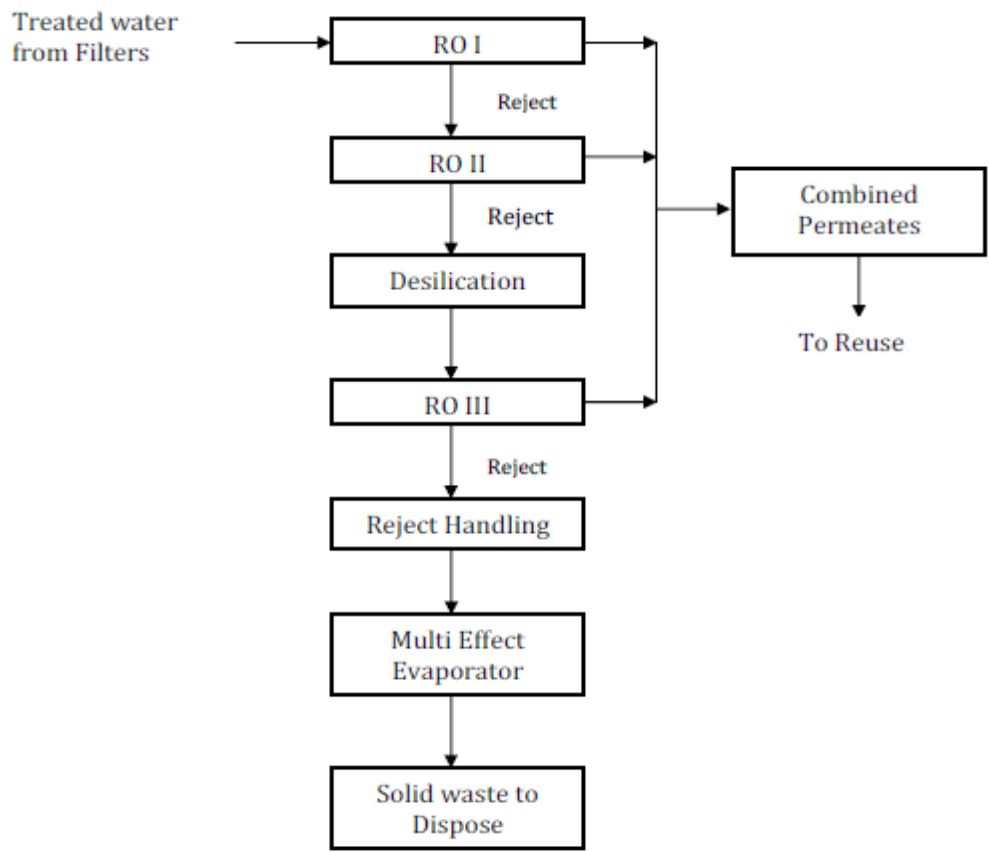
In order to achieve the desirable outlet characteristics of treated wastewater, the Activated Sludge Process has been selected for the Biological Treatment of wastewater at the secondary treatment.. The process flow diagram of treatment is shown in **FIGURE-1**.

Based on the process flow diagram, the components of the CETP were designed. The size of the civil components and specification of the electro-mechanical items have been worked out which is placed subsequently. The additional supply and construction items also have been identified and placed subsequently.

FIGURE-1: PROCESS FLOW DIAGRAM OF TREATMENT SCHEME



g 7.2 Flow chart of Proposed Advance Treatment Scheme- 1B for 60% of Treated water



Note: 100% ZLD to be adopted

3.0 SPECIFICATIONS AND SIZES FOR CIVIL UNITS

- 1) Requirement for all Concrete Structures
 - a) All bedding & leveling concrete shall be minimum 100 mm thick in concrete grade M-10 (1:3:6) unless otherwise specified.
 - b) Liquid retaining structures: The wall & bottom slab thickness shall not be less than 150 mm in any water retaining structure except in launders & channels. The same shall be designed using M-30 concrete design mix with OPC-43 grade and maximum 20 mm aggregate size for all structure members.
 - c) Other structures: concrete shall be M-25.
 - d) Medium reinforcement & cover of concrete shall be as per 7.1 & 7.2 of IS: 3370 part II / as per relevant clause of IS456:2000.
 - e) Water retaining structures such as tanks and sumps and concrete roofs shall be designed on a no crack basis & against uplift pressure assuming sub soil water at Ground Level.
- 2) The size and numbers of CETP units and Minimum recommended Sizes are given in the following Table.
- 3) Any item not covered in this Table, the specifications shall be as that of similar other item. The unit's sizes had been worked out considering various design parameters as applicable to the relevant treatment units with appropriate arrangement and housing of equipment to handle the design flow.

Basic Assumptions for working out cost of civil works

- 1) Item rates for civil works had been taken as per Bihar Govt. Schedule of Rates (2018) for working out the cost of civil works.
- 2) Plinth Area Rates (2018) had been taken for working out the cost Buildings.
- 3) Thickness of RCC structure members had been done as per design
- 4) Assumed avg. quantity of reinforcement steel per Cum. of RCC
 - a) 60 kg for walls & slabs and
 - b) 80 kg for columns , beams & footings
- 5) All building had been considered RCC framed structure with RCC footings, beams, columns, RCC roof slab. However dry sludge store shall have prefabricated/AC sheet roofing.
- 6) All pump houses as required leak-proof, has been considered RCC walls up to plinth level.

Liquid retaining structure shall M-30 concrete design mix with cement OPC-43 grade for all structure members. Reinforcement steel shall be TMT high strength bars Fe-500.

TABLE-TENTATIVE CETP CIVIL UNITS FOR BHAGALPUR 1 MLD

S. No.	Unit Name	Internal Size (Meters) L x B x D or H	Nos. (Qty)
1.	Raw Effluent Intake & Screen Chamber	4.5 x 3.5 x 4.0	1
2.	Screens <i>Coarse Screens</i> <i>Medium Screens</i>	0.60 (W) x 1.50(slant length) 0.60 (W) x 1.50 (H)	1 1
3	Raw Effluent Pump House (PH-1) Raw Effluent Tank Pump Room (Dry Room)	2.50 x 5.0 x 5.0 5.00 x 5.0 x 8.0	1 1
4	Pump House (PH -2) after Equalization Tank – Pump Room (Dry Room)	5.00 x 5.0 x 4.50	1
5	Elevated Receiving Chamber	1.50 x 1.50 x 2.0 (WD = 1.65)	1
6	Open Channel, Screens	7.00x 0.80x 0.80 (WD =0.50)	1
7 a)	Grit removal tanks-cum- Oil & Grease Removal Traps- Circular Shape	3.400 Int. Dia.x 3.0 (SWD)	1
7 b)	Platform for Grit dewatering	2.50 x 2.50 x 1.0	1
8	Equalization Tank	Liquid Holding Volume = 340KL (HRT = 8hours). 10.0 x 8.50 x (4+0.9)	1
9	Physico-chemical Treatment		
9.1a	Flash Mixing Tank -1	1.40x1.40x (2+0.4) (SWD =2.0)	1
9.1b	Flash Mixing Tank-2	1.40x1.40x (1.95+0.45) (SWD =1.95)	1
9.1c	Flocculation Tank	1.70x1.70x (1.90+0.5) (SWD =1.90)	1
9.2	Primary Clarifier	8.0 (ID) x 3.0 (SWD), or SOR=1.0 cu.m / sq.m/ hour	1
10	Chemical House	10.0x7.00 x 5.00	1
10a	Lime Solution Tanks	1.20 x 1.20 x 2.00 (D) (WD=1.70)	2
10b	Ferrous Sulphate Solution Tanks	1.20 x 1.20 x 2.00 (D) (WD=1.70)	2
10c	Polyelectrolyte Solution Tanks	1.00 x 1.00 x 2.00 (WD=1.70)	1
11	Inlet channel of Aeration Tanks	1.0x 1.0,	1
12	Aeration Tanks for extended ASP	HRT= 20 hours. Or 16.00x 11.00x 6.10 (WD= 5.10)	1
13	Secondary Clarifier	Int. Dia.=11.00M, SOR= 0.75cu.M/ hour	1
14	Return Sludge Pump (RAS) House	4.0 x 2.0 x (4+0.5)	1
15	Return Activated sludge holding tank	5.0 x4.0 x (2.5+0.5)	1
16	Chlorine Contact Tank & Filter Feed	5.0 x 4.0 x (2.50+0.5)	1

S. No.	Unit Name	Internal Size (Meters) L x B x D or H	Nos. (Qty)
	Water Storage Tank		
17	PSF (Pressure Sand Filters)	Dia 1.5 x2.50(H, excl. dishes)	2
18	GACF (Gr. Activated Carbon Filters)	Dia 1.65 x2.50(H, excl. dishes)	2
19	Wet Sludge Pump House (PH-3) - a) Sludge holding Tank	5.0 x 2.0 x (2.5+0.6)	1
	b) Pumps Room	7.80 x 5.0 x (3.5+ 4.0)	1
20	Filtration Pump House	3.5x 1.50 x (4+0.5)	1
21	Housing for Twin lobe Blowers	7.0 x 4.50 x 4.0	1
22	PLC Room (Control Center)	6.0 x 6.0 x 3.30	1
23 a)	Housing for Chlorinators	3.0 x 3.0 x 4.0	1
	b) Shed for Chlorine Tonners	4.0 x 4.0 x 4.0	1
24	RCC Platform and Foundations for PSF and Activated carbon Filters	6.0 x 2.5x1.0	2
25	Staging / platform at top of PSF and Activated Carbon filters.	6.0 x 2.0	1
26	Workshop -cum- store	5.0 x 5.0 x 4.0	1
27	Fresh water Over Head Tank and Tube well with suitable Submersible pump set	5.0KL, 10M staging	1
28	Panel Room-1	5.00x 4.0 x 4.0	1
29	Panel Room -2	5.00x 4.0 x 4.0	1
30	Air Compressors Housing	4.0 x 4.0 x 4.0	1
31	RCC Platform for VOLUTE dewatering press and Centrifuge	6.0 x 4.0 x 2.50	1
32	Dry Sludge Storage shed	7.5x 4.50 x 3.30	1
ASSOCIATED OTHER WORKS			
33	Storm water drains within CETP area	As per approved drawing	Lot
34	Boundary Wall surrounding CETP area	Length as per site, 0.25 (W) x 2.00 Ht.	Lot
35	Finishing works, plinth protection, pumps foundations of all pump houses and buildings.	As per requirement	Lot
36	Misc. CC base, covering of pipe with PCC, man holes, Valve chambers, Foundations for 2nos. DG sets.	-- do ---	Lot

S. No.	Unit Name	Internal Size (Meters) L x B x D or H	Nos. (Qty)
37	Connection chamber, inlet pipe lines to Pump house and outlet disposal channel within CETP boundary	-- do ---	Lot
38	Peripheral RCC Road-complete including approach roads to various units /tanks.	-- do ---	Lot
39	Rooms for Watchmen	4.00 x 3.30 x 3.50	1
40	Toilets in Plant area	3.50 x 3.50 x 3.50	
41	Office building	Covered Area = 85sq.M	1
42	Any Other Item not covered Above	Bidder to Indicate	1

Tentative CETP Civil Units FOR RO & MEE TO ACHIEVE 100% ZLD

1	Control Panel A.C & Plant Room	Bidder to Indicate	1
2	Tanks	Bidder to Indicate	1

4.0 SPECIFICATION FOR MECHANICAL EQUIPMENTS AND WORKS

S. No.	Equipment Name	Specifications	Quantity
1	Coarse Screen For inlet/intake chamber of Pump House-1	Mechanically cleaned. Screenings to be brought up to tank top level using mechanical conveyor. MC: SS flats 40 x 4 mm Clear Spacing 30mm. Angle 60° with horizontal	1no. (one)
2	Medium Screens	Manual cleaned. MC: SS flats 30 x 3mm. Clear Spacing=20mm. Angle 60° with horizontal.	2 no. (two)
3	Pumps for untreated effluent Transfer from Pump House-1 and Pump House-2.	Type: Centrifugal, Horizontal, Flooded Suction. Material of Construction: C.I. Casing, SS impeller, SS Shaft, MS Base plate/ Frame. Capacity: 45m ³ / hour. Head: 15m of Water. HP= 5 or as recom. By manufacturer	2nos. (two)
4	Pumps for untreated effluent Transfer from Pump House-1 and Pump House-2	Type: Centrifugal, Horizontal, Flooded Suction. Material of Construction: C.I. Casing, SS impeller, SS Shaft, MS Base plate/ Frame. Capacity: 25m ³ / hour. Head: 15m of Water. HP= 3 or as recom. By manufacturer	4nos. (Four)
5	Pumps for RAS (Return Activated Sludge) Transfer (for extended ASP)	Type: Centrifugal, Vertical, Submerged. Material of Construction: C.I. Casing, SS Impeller, SS Shaft, MS Base plate /Frame. Capacity: 35m ³ /Hour. Head: 14m of Water. HP= 5 or as recom. By manufacturer	2nos. (two)
6.1	Centrifugal Pumps for chemical sludge slurry Transfer from	Type: Centrifugal, Horizontal, Flooded Suction, SP series pumps. Material of Construction: C.I. Casing, SS impeller, SS Shaft, MS Base plate/ Frame.	2nos. (two)

S. No.	Equipment Name	Specifications	Quantity
	Pump House	Capacity: 2.0 M ³ / hour and Head: 30 to 35 M of Water. Sp. Gravity of liquid= 1.08.	
6.2	Screw Pumps for chemical sludge slurry from Pump House	Type: Screw/ Progressive cavity, Horizontal, Flooded Suction, filter press pump. Material of Construction: C.I. Casing, SS screw, MS Base plate/ Frame. Capacity: 2 M ³ / hour. Head: 45M of Water. Sp. Gravity of liquid= 1.08. HP= 3 or as recom. By manufacturer	2nos. (two)
7	Pumps for Filtration Pump House to PSF and ACF	Type: Centrifugal, Horizontal, Suction 3.50 meters. Material of Construction: C.I. Casing, SS impeller and Shaft, MS Base Frame. Capacity: 1no. @45m ³ /Hour.& 2nos. @25 m ³ /Hour. Total Head= 30.0 m HP= 5 or as recom. By manufacturer for 1nos pump and HP= 3 or as recom. By manufacturer for 2 nos pump	Total 3nos. (three)
8	Oil/grease skimmer-cum-Grit Removal scraper	Type: Mechanical Scraper as clarifier. Tank Size- Internal Dia. 3.40M x3.0M SWD. Material of Constr.: SS blades and rake arms. Under water parts SS. Bridge- MS, sand blasted Epoxy painted. Sp. Gravity of material (grit) = 2.60. Complete with drive, Oil skimmer and trough. HP= 3 or as recom. By manufacturer	1no. (one)
9	AGITATORS / MIXERS for Flash Mixer Tanks	MC: SS-316 Impeller & shaft. Tank Size: As per Table -Unit Sizes. Turbine type, 4 blades, detachable Impeller. Impeller dia=0.3M approx. Final RPM= 100approx. HP=1.5 or as recom. By manufacturer. Complete including coupling, MS base Frame.	2nos. (two)
10	PADDLE TYPE FLOCCULATORS For Flocculation Tanks.	MC: SS-316 impeller & shaft. Tank Size: As per Table -Unit Sizes. V-shaped Paddle type, Detachable Impeller. Impeller dia= 1.20M approx. Shaft bottom supported on bush. Final RPM = 15 approx. HP = 1.5 or as recom. By Mfr. Complete-Coupling, MS Base Frame.	1no. (one)
	AGITATORS / MIXERS for Lime Solution Tanks and F.	MC: SS-316 Impeller & Shaft.	4nos

S. No.	Equipment Name	Specifications	Quantity
11	Sul. / Ferric Alum Solution Tank	Tank Size: As per Table - <i>Unit Sizes</i> . Propeller type, Detachable Impeller. Final RPM= 100 approx. Complete-Coupling, MS Base Frame. HP= 1.5 or as recom. By manufacturer	(four)
12	AGITATOR / MIXER For Polyelectrolyte Solution.	MC: SS-316 Impeller & shaft. Tank Size: As per Table - <i>Unit Sizes</i> . Propeller type, Detachable Impeller. Final RPM= 100 approx. Complete-Coupling, MS Base Frame. HP= 1 or as recom. By manufacturer	1no. (one)
13 a)	Dosing Pumps for F S / Ferric Alum and Lime Solution	Discharge range = 200 to 500LPH each Head = 30 Meters of Water Type: metering. MOC: SS-316 Complete with Base Frame. HP= 1 or as recom. By manufacturer	4 nos. (four)
13 b)	Dosing Pumps for PE (Polyelectrolyte) Solution	Discharge range = 100 to 300LPH each Head = 30 Meters of Water Type: metering. MOC: SS-316 Complete with Base Frame. HP= 0.7 or as recom. By manufacturer	2 nos. (two)
14	Mechanical Scraper for Primary Clarifier	Clarifier, size- As per Table - <i>Unit Sizes</i> . MOC - <i>Water immersed parts and scraper shall be of SS-304.</i> Bridge MS, sand blasted, Epoxy painted. All parts should be Epoxy Painted after sand blasting and primer application. Peripheral/ Central Drive system. HP= 1.3 or as recom. By manufacturer. Motor with speed reduction gear box to get final RPH~3. Scraper base Slope = 1:10 towards centre. MS bridge 1000mm wide, railing 1000mm (H), 40mm dia. class B, GI/ MS pipe. Bridge should have	1 Set

S. No.	Equipment Name	Specifications	Quantity
		MS gratings of 12x12mm. Moving scraper arms fitted with blades, neoprene rubber Squeegee pads. With overload alarm device and on /off remote push button switch.	
15	Mechanical Scraper for Secondary Clarifier	Clarifier, size- As per Table - <i>Unit Sizes</i> . Water immersed parts and scraper shall be of SS-304. All other same as above. HP= 1.3 or as recom. By manufacturer	1 set
16	Twin Lobe Blowers for Air supply	High Speed Centrifugal Twin Blowers capacity: 750 M ³ /hour at delivery air pressure head 6.50M of water column. Motor- HP= 30. By manufacturer and RPM (1500 approx) as per manufacturer. Complete with accessories- noise silencer and Acoustics (noise control) enclosure.	2 nos. (1W +1 S)
17	Air Diffusers and Air supply grid	Tubular, dia. = 90mm (minimum). Length=1.0M (minimum). PU/Silicon membrane, with SS feed pipe and SS clamps. Air supply grid- of suitable dia., maximum velocity of air 18m/sec. Pipe Materials shall be- i) From top of tanks/ freeboard to inlet for diffusers- SS304. ii) Grid for air diffusers – CPVC/ SS-304.	Qty. to match air supply =750 cum/ hr.
18a)	Filter Press For Chemical sludge dewatering	Filter Press: Size: 24" x 24" with 23 plates including end plates. Center feed. Operation- Hydraulic for 1 nos and Manual for 1no. MOC: PP plates, End plates- CI, MS Beam and support frame, CI gears, MS shaft. Polyester filter cloth with spare 2 sets. Outlets: 25mm Dia. and filtrate channel. Dewatered cake thick 50mm. HP for Hydraulic Filter Press = 1.3 or as recom. By manufacturer	2nos.
18 b)	Centrifuge / VOLUTE press for sludge dewatering	Capacity =2 KL /hr. Feed sludge concentration =8.0 g/L. Complete with motor, piping, flocculator and feed tank.	1no.
19	Air Compressors for Equalization	Reservoir volume = 300 Litres approx. PVC Perforated pipe line at base / floor in	1 (one)

S. No.	Equipment Name	Specifications	Quantity
	Tank.	Equalization tank. Operating Pr. Range= 7 to 9kg/cm ² . Complete with Main GI pipeline, Ball valves, Pressure Gauge, Noise silencer, Belt guard, FRP / GI cover over motor. HP= 5 or as recom. By manufacturer	
20	Air Blowers for Chemical Mixing Tanks (in Chemical house)	Twin Lobe Rotary Type. Blower Capacity: 100M ³ /Hr. Air Pressure = 4.0M of water column. Blower RPM = 1200 approx. Complete with accessories- noise silencer, Belt Drive with Guard. HP= 5 or as recom. By manufacturer	1 (one)
21	Chlorinators with Tonners	On-line dosing (1.0 kg/hr.) with instrumentation for dosing display and control.	2 (two) sets
22 a)	EOT , Chain Pulley	1.0 MT. Manual operated for pumps, motors and sluice gate lifting. HP= 1.5 or as recom. By manufacturer	6nos (Six)
22 b)	EOT , Chain Pulley	2.0 MT Electrically operated for centrifuge / VOLUTE press lifting. HP= 2 or as recom. By manufacturer	1 (one)
23	Piping, valves, fittings	As per approved drawings. MOC- C.I., MS, G.I. and similar –class B. DI pipes- K9. HDPE, CPVC, PVC and similar- Heavy duty / Pr. Class 10kg/cm ²	Lot
24	Centrifugal pumps for dewatering pits	Centrifugal, vertical, motor coupled, flooded suction. MOC: C.I. Casing and impeller, CS Shaft, Capacity: 3.0 M ³ /Hr. Head: 15.0M. TEFC Motor, 3-Phase, IP-55, 415V. Motor HP= 3.0 or as recom. By manufacturer. Complete with cable. HP= 2 or as recom. By manufacturer	6 nos. (5W+1S)
25	V-notch	MOC- 3mm thick SS-304 sheet fitted in SS frame. Opening (V) Size=500x250mm. Central angle=90°. Calibrated and embossed flow depth (cm) and flow rate (cu.M /hr.)	1 no.
26	PSF (Pressure Sand Filters)	Size: Dia1.50M x2.50M (H, excl. dishes). Other Specifications same as GACF, except Activated	2 nos. (two)

S. No.	Equipment Name	Specifications	Quantity
		Carbon layer.	
27.	GACF (Granular Activated Carbon Filters)	<p>Type of Filters – Vertical with Cylindrical Cell and Elliptical dish ends. Size: Dia 1.65x2.50 (H, excl. dishes). Operation = continuous (24 hours/ day). Working Pressure = 3.0 to 1.25 kg/ cm². Residual Head before Regen = 1.0 kg/ cm² Air Scouring inlet = 100mm NB</p> <p><u>Materials of Construction –</u> <i>Casing /shell</i> – 8mm thick MS sheet, inside rubber lined, outside epoxy paint over primer. <i>Top & bottom Dishes</i> – 10 mm thick MS sheet, inside rubber lined, outside epoxy paint over primer. <i>Strainers</i> - PVC. <u>Filter Media Details-</u> Silica sand, pebbles, gravels as per approved drawing. Material depth = 0.90 M approx. Granular Act. Carbon (GAC)- Coconut shell, depth 600-650 mm.</p>	2 nos. (two)
28	RO & MEE	Please refer quotation for the Specification of RO & MEE Items.	Lot

5.0 SPECIFICATION FOR PIPES AND FITTINGS:

Pipe Details

S. No.	Type of pipe	Class
1.	Ductile Iron S&S	K9
2.	Cast Iron S&S	AB (for grouted / buried under Concrete)
3.	Cast Iron Flanged	B
4.	Rigid PVC	10 Kg f/ sq.cm
5.	GI	Heavy duty-class B
6.	Stainless Steel	Medium class
7.	RCC Pipe S&S	NP3

PIPE FITTINGS

Fittings above 80 NB shall be DI as per relevant specifications in IS/ BS conforming. The puddle collars embedded in the wall shall be of DI.

If flanged cast iron pipes and specials shall be used in the pump houses and to the limit of both suction and delivery pipelines they shall be manufactured and tested according to IS 1536 and 1537 respectively & Flanges shall conform to IS 1538.

NOTES ON EQUIPMENT MATERIALS

1. Materials thickness, where ever not mentioned, shall be sufficient to withstand against the loads including allowance for corrosion, wear & tear.
2. Makes of all fabricated and bought out equipments including major components, shall be as per List of suggested Vendors /makes.
3. Specifications given below are indicative to specify the equipment requirement and their quantities. Accessories for completeness and required operational performance are understood to be included.

6.0 SPECIFICATION FOR ELECTRICAL & INSTRUMENTATION WORKS

Automatic Power Factor Control Panel

The Automatic Power Factor Control of Suitable KVAR capacity suitable for automatic operation and control of Power Factor within the set limits, free standing floor mounting type made out of 2mm CRCA Sheet steel powder coated with channel iron base frame suitable for operation on 3-phase, 4 wire, 50 Hz equipped with the following: -

Incomer

Suitable sets equipped with 250 A MCCB, PF meter, APFC Relay suitable for sequential operation of all capacitor banks.

Outgoing

- Suitable sets of 32A 415V power contactors with fuses.
- Suitable sets of 63A 415 V power contactor with fuses.
- Capacitors Banks as per design & requirement of power Supply Company.
- LT Panel capacitor Banks shall be mounted in the separate LT Panel Board.

Diesel Generating Set

D.G set of capacity to meet 100% (full load) requirement including all ancillary equipment such as base frame, coupling, coupling guard, control panel and exhaust piping system etc. including electric wiring between control panel and starting batteries.

Electrical Panel

A separate panel (bay) should be provided for individual pump house. The control panel shall be made up of 2mm sheet steel with 7/9 tank process powder coating for long life. The control panel should contain ACB/MCCB (as per design requirement) of suitable rating contacts relays of reputed make.

GENERAL SPECIFICATIONS FOR ELECTRICAL PANELS

There shall be separate Power panels for each pump house, chemical house and blowers etc.

- Power panels shall contain Incomer, MCCB, Bus bars, SFU, Relays, Online Indicators, ON/OFF Rotary switches, Starters (DOL starter up to 10 HP and Star-Delta Starters above 10 HP load) and **Spares** of suitable capacities and adequate in numbers.
- Proper earthing systems/ earth pits shall be provided wherever required.
- Each equipment shall be provided with push button station for local ON/OFF

- Panels shall be indoor type, metal clad, floor mounted, free standing, totally enclosed, extensible type, air insulated, cubicle type for use on 415 Volts, 3 phase, 50 cycles system with a fault level withstand of 31 MVA / 35 MVA RMS.
- Panels shall be designed to conform to the requirements of conform to the relevant IS specifications and shall be provided with required hardware such as control cabling, contactors, and spares.

The structure shall be mounted on a MS Channel of required size. The design shall ensure that the weight of the components is adequately supported without deformation or loss of alignment during transit or during operations.

- Panel's doors and covers shall be of minimum 2 mm thick sheet steel. Sheet steel shrouds and partitions shall be of minimum 2mm thickness. All sheet panels shall be smoothly finished, leveled and free from flaws. The corners should be rounded.
- The apparatus and circuits in the power control centers shall be so arranged as to facilitate their operation and maintenance and at the same time to ensure the necessary degree of safety.
- All doors / covers providing access to live power equipment / circuits shall be provided with toll operated fasteners to prevent unauthorized access.
- Provision shall also be made for permanently earthing the frames and other metal parts of the switchgear.
- Specifications as per relevant BIS codes shall apply.
- There shall be separate Power panels for each pump house, chemical house and blowers etc.
- Power panels shall contain Incomer, MCCB, Bus bars, SFU, Relays, Online Indicators, ON/OFF Rotary switches, Starters (DOL starter up to 10 HP and Star-Delta Starters above 10 HP load) and Spares of suitable capacities and adequate in numbers.
- Proper earthing systems/ earth pits shall be provided wherever required.
- Each equipment shall be provided with push button station for local ON/OFF operation.

The following protections should be provided in the panel board:-

- Overload protection
- Short circuit protection
- Earth fault protection
- Shunt trip & under voltage protection.

OPERATIONAL REQUIREMENT/INTERLINKING OF ELECTRICAL PANEL AND INSTRUMENTATION

The biological treatment process (extended ASP) shall be PLC controlled through SCADA. All MC panels shall have provision of Change –over Switches for operation of 100% equipment through CAPTIVE (DG) Power.

All MCC panels shall have provision of Change–over Switches for operation of 100% equipment through Captive Power (DG set) for each module.

1. Effluent Transfer Pumps in Pump House-1 (PH-1):
 - a) Each Pump for independent operation manual/automatic modes.
 - b) Level sensor in Wet Well with Alarm system, when TWL (or Water Depth) reaches 2500 mm above the Base floor.
2. Pumps in Pump House -2 (PH-2): Each Pump for independent operation manual/ automatic modes.
3. RAS Transfer Pumps: Each pump for automatic operation/manual modes.
4. Pumps in Wet Sludge Pump House -3 (PH-3): Each Pump for independent operation manual modes.
5. Flash mixer Agitators and Flocculation Paddle Mixers: - to be interlocked with Chemical dosing pumps for synchronous operation.
6. Chemical Solution Tanks Agitators and Air Blowers: Independent and Separate control.
7. Air blowers and all other Equipments: For independent and Separate control for aeration tanks.
8. Pumps in Filtration Pump House -4 (PH-4): Each Pump for independent operation manual modes.

The **level controllers** of Pump Houses shall be connected to MC panel in such a manner that pump (which was running) starts operating when water level reaches at the upper ON level and stops when water level reaches at the Lower OFF level in Effluent tank. The level controllers of Raw Effluent Pump House-1 shall be connected to panel in such a manner that third pump (first standby) starts operating when water level reaches above the normal TWL level in the wet well.

INSTRUMENTATION

The Aeration System Shall Be PLC Controlled For Automatic Operation Through SCADA.

a) ULTRASONIC FLOW METER & TOTALIZER

Compact on-line ultrasonic flow converter directly mounted on the ultrasonic flow sensor.

Input: Effluent of pressure sand filters and Activated carbon filters having solid particle content < 2%, gas content < 1% (by volume) and TSS less than 100mg/L. Pipe dia. 300mm to 500mm.

Output required:

Measurement functionality: Digital display of Flow rate and Total volume.

Measuring range: Flow= 0 to 700 Cu.M. /hour.

Measuring error (under site conditions): Not to exceed $\pm 1.0\%$ of value.

b) ON-LINE pH METER

Compact weather proof and temper- proof on-line probe with Digital display.

Input: Effluent of pressure sand filters and Activated carbon filters having

- Solid particle content < 2%, gas content < 1% (by volume) and TSS less than 100mg/L.

- pH range 5.0 to 11.0

Output required:

Measurement functionality: on-line pH value.

Measuring range = 5.0 to 11.0.

Perm. Error (under site conditions): Not to exceed $\pm 2.0\%$ of measured value.

c) On Line Water Quality Monitoring at Common Effluent Treatment Plant (CETP)

List of Effluent Water Parameter Monitoring at each process stages at CETP

A) At inlet

pH, Flow, BOD, COD, Total Suspended Solids (TSS)

Universal Multi Controller with Display Unit

Wireless Remote Data Logger for Transmitting Data Using GSM/GPRS

B) Aeration Basins

Dissolved Oxygen measurement and Luminescent display for each Tank. Nitrate Sensor with spectro-photometry principle.

Universal Multi Controller.

Wireless Remote Data Logger for Transmitting Data Using GSM/GPRS.

C) Third Point at filters /final outlet – BOD,COD, Nitrate, Total Suspended Solids (TSS), TDS with self-cleaning Universal Multi Controller

Wireless Remote Data logger for Transmitting Data Using GSM/GPRS

Online Real Time CETP Water Quality Monitoring

As per CPCB guidelines Real Time CETP Water Quality Monitoring & Central Network shall be installed for parameters viz. pH, TSS, temperature, Biochemical Oxygen demand (BOD), Chemical Oxygen Demand, Nitrate, and DO. Chlorine and Flow with remote as well as local display in control room. The wireless connection shall be preferred for control room display.

The Water Monitoring Stations shall provide real time data through GSM/GPRS network at scheduled intervals automatically or as and when requested by the users.

7.0 ADVANCE TREATMENT FOR ZLD

The **100%** of filtered water is further passed through 3 stage Reverse Osmosis Membrane at a designed high pressure enabling removal of dissolved ions. The filtered water is passed through this advance technology to achieve Zero Liquid Discharge scheme. The treated water will be used in industrial premises for production process. The Reverse Osmosis system generates a huge amount of water called Reject that is to be passed through Multi-effect evaporation as to follow ZLD scheme.

8.0 LIST OF APPROVED MAKE FOR MECHANICAL AND ELECTRICAL EQUIPMENTS:

LIST OF APPROVED MAKE FOR MECHANICAL AND ELECTRICAL EQUIPMENTS:

The following is the list of products and name of the approved manufacturer against each product. The bidder shall quote rates for the various items of works using these products.

Recommended Make of Equipment's for CETP		
Sr.	Equipments	Make
1	Multi Effect Evaporators (MEE)	Shivlac / Mazda / Ketav / Praj /Water 2 people Teknologies (W2P) / Equivalent
2	Stripper	Shivlac / Mazda / Praj / Water 2 people Teknologies (W2P)/ Equivalent
3	Agitated Thin Film Drier (ATFD)	Shivlac / Mazda / Praj / / Water 2 people Teknologies (W2P)/Equivalent
4	Mechanical Vapour Recompressor (MVR) Blower	Killer/
5	Cooling Tower	Paharpur / Unimod/ GEA/ Equivalent
6	Boiler	Thermax / IAEC/Cether Vessels/Thyssenkrupp/ Equivalent
7	DG Sets	Kirloskar/Cummins/ Mahindra/ Equivalent
8	pH meter/ pH sensor	Rosemont /Hach/Equivalent
9	Flow Meter	E&H / Rosemount / / Water 2 people Teknologies (W2P)/ Equivalent
10	PLC	L&T / Siemens / ABB/ Equivalent
11	Electrical Cables	Finolex / Havel's / Polycab / Equivalent
12	Electrical Components for MCC Panel	L&T / Siemens / ABB/ Equivalent
13	HDPE / PP Tanks	Syntax / Ganga / Equivalent
14	MS Pipies	Tata / Jindal / Surya/ Equivalent
15	HDPE Pipes	Hasti / Supreme/ Phenolex/ Equivalent
16	PVC Pipes	Astral / Finolex/ Supreme
17	CI/CS Valves	Kirloskar / Sant / Kor / Equivalent
18	PP Valves	Astral/ Prashit/ Equivalent
19	Wastewater Pumps	Kirloskar / KSB/ Beacon / Equivalent
20	Dosing Pumps	Asia LMI/ Positive/ Swellor / Equivalent
21	Agitators / Flash Mixers / Flocculator/ Clarifier	Geo Miller / HDO/ Distington/ / Water 2 people Teknologies (W2P)/ Equivalent
22	Gear Boxes	Greaves/ Elecon/ Radicon / Equivalent
23	Steel Material	TISCO/ SAIL / Equivalent
24	Cement (OPC Grade-53)	ACC/ Grasim/Ultratech/ Ambuja

25	Fire Extinguisher	ABC/ Minimax/ Equivalent
26	Laboratory Instruments	Hach/ WTW/ Other Standard Brands
27	Screens	Jash / Huber / Shivpad/ / Water 2 people Teknologies (W2P)/ EMCO KCP
28	Diffusers	Titan Aeration / EDI / / Water 2 people Teknologies (W2P)/ Rehau
29	Pressure Tube	Pentair / Advance Composite / Maxima / ROPV
30	RO Membrane	DOW / HYDRANAUTICS/ TORAY/ LG
31	UF MEMBRANES	Norit / Asahi / Inge / Hydranautics / Dow
32	CENTRIFUGE	HILLERDECANTER/ Water 2 people Teknologies (W2P)/ ALFALAVAL
33	FILTERPRESS	SACHIN / Water 2 people Teknologies (W2P)/ Dinshaw/ Pharmatec/ Votana/ Andritz
34	DOSINGPUMPS	MILTONROY/ Grundfos
35	AGITATORS	SUDARSHAN / Water 2 people Teknologies (W2P)/ Grundfos/Remi/DWS
36	CENTRIFUGAL PUMP	GRUNDFOS/ Flow serve/ KSB/ KBL/ITT
37	SUBMERSIBLE PUMP	GRUNDFOS/ Flow serve/ KSB/KBL/ITT
38	SCREW PUMP	ROTO / Water 2 people Teknologies (W2P)/ NETZSCH/ ROTOMAC
39	HIGH PRESSURE PUMP	GRUNDFOS/ KSB/FLOWSERVE/SAM TURBO/ DANFOS/FEDCO
40	BUTTERFLY VALVE	AUDCO/ BDK/FLOWSERVE/KBL/INTERVALVE/ LEADER
41	NON RETURN VALVE	AUDCO/ BDK/FLOWSERVE/KBL/INTERVALVE/ LEADER
42	BALL VALVE	LEADER/ ASAN/TATA/JINDAL
43	GI PIPE	JINDAL/ TATA/SURYA ROSHNI
44	Power Cable/ Control Cable	CCI/ Deltron/Finolex/Polycab
45	Motor	Toshiba/ Alstom (Marathon)/BHEL/SIEMENS/ABB/ Crompton

46	UPS	Toshiba/ Emerson/ Luminous
47	MCC/ PMCC Components	ABB/ L & T/ Mitsubishi/ Schneider/GE
48	VFD	Toshiba/ Mitsubishi/ Siemens/ ABB/ Schneider/ Crompton
49	Battery	AMCO/ Exide/
	Instrumentations	
1	Pressure/ Temperature Gauge	Ashcroft/ Baumer/ANI/ H Guru
2	Pressure/ Temperature Transmitter	Emerson/ Siemens/ ABB/Honeywell
3	Pressure/ Temperature Switch	Honeywell/ Switzer/ Nesstech
4	Rotameter	Chemtrol/ Forbes Marshall/ Scientific Instruments
5	Flow Transmitter	Emerson/ Endress + Hauser/ Forbes Marshall/ABB/ Siemens
6	Level Switch	ABB/ Forbes Marshall/ Endress + Hauser
7	Level Transmitter (Ultrasonic/ Radar)	Emerson/ Endress + Hauser/ Siemen
8	Analyzers	Emerson/ HACH/ ABB/Forbes Marshall
9	Solenoid Valves	Asco Valves, Honeywell, Rotex Automation
10	PLC/ HMI/ SCADA	Toshiba/ ABB/ GE/ Rockwell/Schneider

Note: Electro-mechanical and RO items of- ROCHECM, Alfa Therm, A1 Blowers, Kohler DG Set, Mahindra DG Set, CCI Transformer, Water 2 People Technologies, Wilo, Xylem, Everest, TMVT, KETAV Consultant for MEE, Johnson or better may be used. Apart from these ISI/ BIS / ISO approved make of items may be used prior to permission of Engineer-in-charge.

9.0 ADDITIONAL ITEMS:

OTHER ITEMS LIKE

- a. Dewatering and treatment of water logged at proposed CETP Site
- b. Installing flow meter with totalizer at Industry level will be the scope of Member Units.
- c. Continuous monitoring System at Industry level or at Group of Industries will be the scope of Member Units. Storage and primary treatment of Hazardous & Bio Degradable waste.
- d. The collection treatment storage and disposal of hazardous waste or sludge, Biological sludge, evaporator salt etc. is under the scope of bidder as per the guidelines of Pollution Control Board and other statutory body.
- e. CCTV need to be installed for the monitoring of operation of CETPs.
- f. The required infrastructure for temporary collection, treatment, storage and disposal of Hazardous waste for 6 months need to be included by the bidders in the project cost.
- g. The stored Hazardous waste should be disposed at nearby TSDF facility, the cost towards handling disposal of Hazardous Waste/ Evaporator Salt at nearby TSDF will be scope of bidder.
- h. The biodegradable sludge should be disposed as per solid waste management rules- 2016 at nearby landfill facility, the cost towards handling disposal of biodegradable sludge will be the scope of bidder.
- i. Demolition and associated work if required will be scope of bidders.
- j. Underground RRC Treated water tank for distribution of water for reuse.
- k. Cost of vetting of design drawing from the competent authority.
- l. Cost of CTE & CTO
- m. Cost towards field laboratory for the testing of civil materials.
- n. Cost of testing of samples from NABL Lab as per project requirement.
- o. Cost of amendment in Environmental Clearance if required

Note: The work mentioned at various parts of RFP need to be executed by the bidders and the cost of all the works should be included.

10.0 REFERENCE DOCUMENTS (REFER WEB SITE OF BIADA)

Following reference documents are available on the web site of BIADA for understanding of the project and design of CETP:

- (i) Pre-treatment norms of CETPs
- (ii) Soil Test Report
- (iii) RO Quotation for getting specification and guidance
- (iv) MEE quotation for getting specification and guidance
- (v) Layout Plan
- (vi) Copy of Terms of Reference (TOR) of Environmental Clearance
- (vii) Hydraulic Flow Diagram. (HFD)

**AVERAGE CHARACTERISTICS OF COMBINED UNTREATED EFFLUENT FOR DESIGN
(GRAB SAMPLE COLLECTED IN THE MONTH OF NOV 2019)**

Sr. No.	Description	Unit	Results
1	pH	-	7.20
2	Total Suspended Solid (TSS)	mg/lit	40
3	Total Dissolved Solids(TDS)	mg/lit	762
4	Chemical Oxygen Demand (COD)	mg/lit	81.62
5	Sulphate (SO ₄)	mg/lit	23.11
6	Total Hardness	mg/lit	370
