SDTPC
SOUTHERN DISTRICT
TEXTILE PROCESSING CLUSTER PRIVATE LIMITED
No.13, Navarathinapuram 3rd Street,
(Near Abirami Theatre) Kamarajar Salai, Madurai-625009.
e-mail:sdtpcluster@gmail.com

Date :
18th December, 2017

The Member Secretary
SEIAA, Tamil Nadu
Third floor, Panagal Maligai,
No.1, Jeenis Road, Saidapet,
Chennai – 600 015.

Dear Sir,

Sub: Environmental Clearance for the Proposed Textile Processing Cluster by M/s. Southern District Textile Processing Cluster Private Limited at Pottalkulam and Tamaraikulam Villages, Kariyapatti Taluk, Virudhunagar District, Tamil Nadu - Submission of Additional Details required by SEIAA-reg.

Ref: Lr. No. SEIAA/TN/F.No.4778/SEIAA/2017 dated:13.12.2017

We acknowledge the receipt of the above mentioned letter. With reference to the subject as above, we herewith submit the additional details as requested, for your kind perusal. Kindly acknowledge the same and arrange to issue the environmental clearance.

Thanking you

Yours faithfully
For ***Southern District Textile Processing Cluster Private Limited***

(M.ELANGO)
Director

Encl: a/a

सत्यमेव जयते

THIRU A.V. VENKATACHALAM,I.F.S MEMBER SECRETARY	STATE LEVEL ENVIRONMENT IMPACT ASSESSMENT AUTHORITY – TAMIL NADU 3rd Floor, Panagal Maaligai, No.1 Jeenis Road, Saidapet, Chennai-15. Phone No.044-24359973 Fax No. 044-24359975

Lr.No.SEIAA/TN/F.No.4778/SEIAA/2017 dated. 13.12.2017.

To
M/s. Southern District Textiles Processing Cluster Pvt. Ltd.
No.13, Navarathinapuram 3rd Street,
kamarajar Salai
Madurai
Madurai-625009

Sir,

Sub: SEIAA-TN – Proposed project for setting up an Industrial cluster exclusively for Textile processing in a plot area of 40.31.5 Ha in housing CETP facility of 6 MLD and coal based captive power plant of 2.2 MW by M/s. Southern District Textile Processing Cluster (P) Limited at S.F.No. 2/3, 6/3, 4/1, 6/7, 4/2, 6/6, 4/3, 6/5, 3/1, 6/4, 6/2, ½, 1/3, ¼, 1/5, 1/6, 1/7, 6/8, 6/9, 6/10, 1/8, 2/2, 3/2, 1/9, 1/10, of Pottalkulam Village & 46/1, 48/1, 48/2, 48/3, 48/4, 49/1, 49/2, 50/1, 6/3A, 6/4, 6/5A, 6/6A, 6/7A, 6/7B, 7/2, 7/3, 7/5A, 7/5B, 46/2 of Tamaraikulam Village, Kariyapatti Taluk, Virudhunagar District – Seeking Environmental Clearance – Schedule No. 7(c) [Industrial Estates/parks/complexes/areas, export processing zones (EPZs), Special Economic Zones (SEZs), Biotech Parks, Leather Complexes] & 7(h) [Common Effluent Treatment Plants (CETPs)] of Category 'B' projects - regarding – Additional details requested – Regarding

Ref: 1. Your Application dated: 27.12.2015
2. Minutes of the 95th SEAC meeting held on 06.10.2017.
3. Minutes of the 259th SEIAA meeting held on 13.12.2017.

- - - - -

With reference to your application seeking Environmental Clearance for Proposed project for setting up an Industrial cluster exclusively for Textile processing in a plot area of 40.31.5 Ha in housing CETP facility of 6 MLD and coal based captive power plant of 2.2 MW by M/s. Southern District Textile Processing Cluster (P) Limited at S.F.No. 2/3, 6/3, 4/1, 6/7, 4/2, 6/6, 4/3, 6/5, 3/1, 6/4, 6/2, ½, 1/3, ¼, 1/5, 1/6, 1/7, 6/8, 6/9, 6/10, 1/8, 2/2, 3/2, 1/9, 1/10, of Pottalkulam Village & 46/1, 48/1, 48/2, 48/3, 48/4, 49/1, 49/2, 50/1, 6/3A, 6/4, 6/5A, 6/6A, 6/7A, 6/7B, 7/2, 7/3,

7/5A, 7/5B, 46/2 of Tamaraikulam Village, Kariyapatti Taluk, Virudhunagar District vide reference 1st cited.

The said proposal was placed in the 259th SEIAA meeting held on 13.12.2017. The Authority decided to seek additional details as follows:

1. The process chemicals - chemical consumption including salt projected in the tabulation No.2.3 (Page No. C2-6) is not realistic. This has to be revised based on the material balances. The revised material balances and chemical consumption shall be furnished.

2. Recovery of salt and other hazardous waste based on the above changes shall also be corrected.

3. The Environment management Plan - this should be of two parts
i. Construction phase
ii. Operation phase
Each stage shall be provided with capital investment, man power requirement, consumables, electricity, environmental monitoring. It should also include rain water harvesting and storm water management and captive power plant.
EMP should also indicate cost / kg of fabric processed and matching budgetary provisions shall be provided in the DPR. In case, it is need to be revised, the revised DPR shall also be furnished.

4. Water supply- it is informed that they are going to draw entire water (638 KLD daily requirement) through bore wells. A study shall be conducted to ensure whether the ground water potential in the surrounding area is not likely to be affected. The PWD have permitted to draw 200 KLD only.

5. The captive co generation plant requires coal and fly ash handling safe guards. This may be clarified.

6. There are innumerable water bodies, Guntur stream in the vicinity and drainage passing within the site, the safety measures against the pollution of the system should be mentioned.

7. Laborers likely to be employed and will it affect the agriculture in the vicinity. This may be clarified.

8. The green belt should be revised to include Avenue plantation and tree planting in clusters. Green belt establishment should be maintained for atleast 5 years.

9. Action likely to be taken to protect soil and augment water sources hydrological system within the site like providing check dams and other water harvesting structures may be clarified, with budget provisions.

10. CSR should earmark more funds for afforestation.

Hence, you are requested to furnish the above said details by uploading the same through online & also to submit the hard copies of the same to this office at earliest.

For Member Secretary
SEIAA-TN

13/12/17

Lr. No. SEIAA/TN/F.No.4778/SEIAA/2017 dated: 13.12.2017		
Sr. No.	**Query**	**Reply**
1.	The process chemicals - chemical consumption including salt projected in the tabulation No.2.3 (Page No. C2-6) is not realistic. This has to be revised based on the material balances. The revised material balances and chemicals consumption shall be furnished.	The revised list of chemicals used along with the raw materials to be used for Fabric and Yarn Dyeing is attached as **Annexure - I**.
2.	Recovery of salt and other hazardous waste based on the above changes shall also be corrected.	Only the quantity of recovered salt from the Multiple Effect Evaporator will be changed and the corrected salt recovery will be about 654 TPM. The quantity of biological sludge generated will remain same.
3.	The Environment management Plan – this should be of two parts. i) Construction Phase ii) Operation Phase Each stage shall be provided with capital investment, man power requirement, consumables, electricity, environmental monitoring. It should also include rain water harvesting and storm water management and captive power plant. EMP should also indicate cost/kg of fabric processed and matching budgetary provisions shall be provided in the DPR. In case, it is need to be revised, the revised DPR shall also be furnished.	During the Construction Phase, an amount of Rs. 10 Lakhs is proposed to be spent on Environmental Management measures. The EMP during Operation phase including capital investment, man power requirement, consumables, electricity, environmental monitoring and cost per kg of fabric is provided in the DPR and is attached as **Annexure – II**.
4.	Water Supply – it is informed that they are going to draw entire water (638 KLD daily requirement) through bore wells. A study shall be conducted to ensure whether the ground water potential in the surrounding area is not likely to be affected. The PWD have permitted to draw 200 KLD only.	The proposed project shall not have any impact on the ground water potential of the surrounding area. To assimilate the ground water status of the study area, the Department of Civil Engineering, Annamalai University had been assigned to conduct the hydrological study in the study area. The field work was carried out on 11th June, 2017. <u>GEOLOGY OF THE STUDY AREA & PROJECT SITE:</u> • The geological formations of the study area are dominated by alluvium, sandstones, basic metamorphic rocks, limestone and charconites. • The major part of the study area is covered by alluvium brought by the rivers flowing from the west of this region. <u>HYDROGEOLOGY:</u> <u>i) Water Bearing Formation:</u> • The alluvial formations comprising mainly sand, clays and gravels are confined to

		major drainage courses in the district. • The maximum thickness of alluvium is 35.0 m whereas the average thickness is about 25.0 m. • Alluvium which forms a good aquifer system along the Vaippar and Gundar river bed, is one of the major sources of water supply to the villages. <u>ii) Water Levels:</u> • The depth to water level in the district varied between 9.6 and 7.4 m bgl during pre-monsoon and varied between 9.4 and 5.6 m bgl during post monsoon. • The seasonal fluctuation shows a rise in water level which ranges from 7 m to 18 m. <u>Movement & Distribution of Ground Water:</u> • A review of the topography and drainage pattern reveals that the general slope of the study area is towards east/southeast. • Based on the water level data, the overall ground water flow direction is towards east/southeast following the topography of the area. • Ground water occurs under phreatic to semi-confined conditions in these formations and is being developed by means of bore wells and filter points. • The aquifers are fairly thick & regionally extensive with large yield prospect of bore wells drilled to a depth of 60 to 70 m, with the yield ranging from 10 to 358 lpm (litres per minute). • The proposed project may not utilize the ground water, with the implementation of rainwater harvesting structures and adopting zero liquid discharge practices to prevail return recharge for their continuous yield throughout the year. The hydrology study report is given in **Annexure – III**.
5.	The captive co generation plant requires coal and fly ash handling safe guards. This may be clarified.	The coal requirement per day will be 28 TPD and will be sourced from Indonesia. The coal will be transported from Tuticorin port to the project site by closed body trucks. The details of the safety measures adopted at coal and fly ash handling areas are given in **Annexure - IV**.
6.	There are innumerable water bodies, Guntur stream in the vicinity and drainage passing within the site, the safety measures against the pollution of the system should be mentioned.	The safety/mitigation measures proposed during both the construction and operation phases of the project are given in **Annexure - V**.

7.	Laborers likely to be employed and will it affect the agriculture in the vicinity. This may be clarified.	The proposed project will create direct employment for only 800 persons, within the 25 km radius from the project site. As per the Virudhunagar District Census Handbook, 2011, the total study area population is about 1,29,544. Out of this, total working population including main and marginal workers, are 71,520 persons. The data provided above is only for 10 km radius study area. However, the proposed project will draw employees from an area surrounding 25 km radius. At present, the nearby village area people are employed in a private spinning mill at Aruppukottai. Hence, there will not be any shortcomings of employees who are involved in the agricultural activities. Further, setting up of the textile cluster will help in reducing the poverty, by providing employment and also skill development and training programs as part of CSR.
8.	The green belt should be revised to include Avenue plantation and tree planting in clusters. Green belt establishment should be maintained for at least 5 years.	The Greenbelt area has been allocated with respect to the roadside and avenue plantation, individual member units plantation and admin area. We assure to establish and maintain the greenbelt for a period of 5 years from plantation.
9.	Action likely to be taken to protect soil and augment water sources hydrological system within the site like providing check dams and other water harvesting structures may be clarified, with budget provisions.	Adequate rain water harvesting systems and check dams will be provided. The budget for the same will be around 169 pits @ Rs. 15000 = 25.35 Lakhs Two Check dams @ Rs. 2.00 Lakhs = 4.00 Lakhs. Total will be Rs. 29.35 Lakhs. This will be taken care from the Preliminary and Preoperative expenses.
10.	CSR should earmark more funds for afforestation.	Afforestation activities will be carried out as a part of CSR activities, in the study area or land identified for plantation in association with the Tamil Nadu State Forest Department (SFD). The land area for afforestation will be identified based on the availability of Non-Forest Land (NFL) and Degraded Forest Land (DFL) in consultation with the SFD/District Forest Department. At least 1000 plants per hectare will be planted as per the guidelines of MOEF&CC. For afforestation activities a capital cost of INR. 1.0 Crore Rupees has been allocated. The revised CSR activities is given in **Annexure – VI**.

Annexure - I

Details of Raw Materials

ANNEXURE – I
DETAILS OF RAW MATERIALS

Details of Raw Material for Fabric Dyeing (for 2.0 Tons per day of Production)

Sl. No.	Name of Raw Material	Percentage	Quantity (kg)
1	Wetting Oil	0.1	2
2	Caustic Soda	4	80
3	Hydrogen Peroxide	3	60
4	Stabilizer	2	40
5	Dyes	3.5	70
6	Sodium Chloride	4 grams per litre	400
7	Soda Ash	15 grams per litre	1500
8	Dye Fixing Agent	0.2	4
9	Silicon Softener	3	60
10	Cationic Softener	2	40
11	Water (10 baths)	1:5	1,00,000 Litres

Details of Raw Material for Yarn Manufacturing (Hot Wash) (for 1.0 Ton per day of production)

Sl. No.	Name of Raw Material	Percentage	Quantity (kg)
1	Wetting Oil	1.3	13
2	Caustic Soda	3	30
3	Sodium Hypochloride	5	50
4	Sulphur	0.15	1.5 Litres
5	Dyes	0.0045	0.45
6	Sodium Chloride	4	40
7	Soda Ash	0.8	8
8	Acetic Acid	0.9	9
9	Water (7 baths)	@15020 Litres/ bath	1,05,000 Litres

Annexure – II

EMP Cost Provision

Chapter 8: Project Cost and Means of Finance

Basically, the critical elements of project cost in terms of fixed assets and investment include:

- land and site development
- building and civil works
- machinery and equipment
- miscellaneous fixed assets such as furniture and fittings
- P&P expenses
- contingency margin
- margin for working capital

As per the guidelines of the scheme land development is excluded from project cost for purposes of computation of grant. So, also is margin for working capital and MFAs. But they are included for financial projections and analysis of project viability.

Table 16: Total Project Cost

S. No	Particulars	Amount (in Rs. Lakh)
1	Land (Rs.1.50 lakh per acre for 26.22 acres) and land development (@ Rs. 5 lakh per acres)	170.43
2	Building and civil works - **Please refer to Annexure 7; Page no -190-193**	7131.76
3	Plant & Machinery and accessories and related equipment (including 10% test run and performance trial related expenses on total cost of Rs. 6408.52) - **Please refer to Annexure 10; Page no -200-202**	7049.37
4	Miscellaneous fixed assets (furniture, fixtures, firefighting equipment, first-aid equipment)	100.00
5	Preliminary (DPR Preparation, legal & administrative expenses, registration, detailed civil engineering drawings with estimates and tender forms, tendering cost, telephone, stationery, etc.) and Pre-operative expenses (establishment costs, travel, overheads during construction period including salaries) and PMA charges	700.00
6	Working capital margin (at operating capacity of 80 %)	49.71
	Total	**15201.27**

The cost of land and land development to the tune of Rs.170.43 lakh is not included as part of the project cost (nor is working capital margin nor MFA), as indicated.

It is envisaged that the project will be financed by a mix of equity, grant-in-aid and debt. Working capital loan and term loan is to be secured from the State Bank of India. The assistance to the project from the Govt. of India is envisaged to the tune of maximum 50 per cent of eligible components of project cost (excluding cost of land and working capital margin and MFA and from the GoTN to the tune of 25 per cent of such project cost components. About 10 per cent is to be provided as TL by the bank.

The balance will be brought by the project SPV by way of equity. The following tabulation summarises the mix:

Table 17: Means of Finance

Sl. No.	Means of finance	Amount (in Rs. Lakh)	% Contribution mix
1	Contribution of SPV	2552.31	16.79
2	Grant-in-aid under IPDS (50% grant-in-aid on project cost on eligible components of project cost)	7440.57	48.95
3	Funding from the GoTN, Government of Tamil Nadu (25% on eligible components of project cost)	3720.28	24.47
4	Term Loan (10% on eligible components of project cost)	1488.11	9.79
	Total	**15201.27**	**100.00**

Estimation of Central Govt. grant and GoTN assistance

The components eligible for Central Govt. assistance as well as component-wise break-up is presented in the table:

S. No	List of Components in the Project	Cost of Component (Rs. In lakh)	Central Grant (Rs. In lakh)	% of central grant	Contribution from GoTN	% of GoTN grant	Term Loan	% of TL contribution	Contribution from SPV	% of SPV contribution
1.	Land and land development	170.43	-	-	-	-	-	-	170.43	100%
2.	Building and civil works	7131.76	3565.88	50%	1782.94	25%	713.18	10%	1069.76	15%
3.	Plant and Machinery (including 10% test run and performance trail related expenses)	7049.37	3524.69	50%	1762.34	25%	704.94	10%	1057.41	15%
4.	Miscellaneous Fixed Asset	100.00	-	-	-	-	-	-	100.00	100%
5.	Preliminary and Pre-operative expenses	700.00	350.00	50%	175.00	25%	70.00	10%	105.00	15%
6.	Working capital margin	49.71	-	-	-	-	-	-	49.71	100%
	Total	**15201.27**	**7440.57**	**-**	**3720.28**	**-**	**1488.11**	**-**	**2552.31**	**-**

Assistance from the GoTN is envisaged to the tune of Rs.3720.28 lakh of the eligible components of the project cost and from the GoI to Rs. 7440.57

8.1. Core plant, machinery and equipment and physical infrastructure

Important machinery and equipment necessary for the proposed project is CETP, co-generation steam boiler, testing lab and drier. Physical infrastructure components are to include road network, water and sewerage networks etc.

(i) Share Capital

The contribution of the SPV members will be by way of subscription to shares in the SPV registered as a Private Limited Company. The extent of paid-up share capital/equity contribution would be Rs. 2552.31 lakh contributed by the cluster SPV.

The authorised share capital of the company will be Rs.2600 lakh.

(ii) Grant-in-aid

Grant-in-aid of Rs.7440.57 lakh is expected from the Government of India. Grant – in –aid of Rs. 3720.28 lakh is expected from GoTN.

(iii) Term Loan

Term loan to the tune of Rs. 1488.11 is envisaged from the bank.

8.2. Expenditure estimates

This section considers annual cost of production and expenditure estimates. The critical components related to expenditure comprise consumables, manpower, electricity and also expenditures by way of repairs and maintenance, insurance and administrative overheads.

Other elements comprise expenditures by way of servicing loans, administrative and other overheads and non-cash depreciation expenditure.

8.2.1. Consumables

Consumables required for the project facilities may be critically visualised in terms of replacement of pump motors, valves, chemicals such as anti-scalant, filtering media, boiler fuel-coal etc.

Table 18: Annual requirement of consumables

<table>
<tr><th>S. No.</th><th>Facility</th><th>Particulars</th><th>Amount (@ 100% C.U. in Rs. Lakh)</th><th>Amount (@ 80% C.U. in Rs. Lakh)</th><th>Amount (@ 85% C.U. in Rs. Lakh)</th></tr>
<tr><td>1</td><td>CETP Facility</td><td>Chemicals (colour removal agent; co-agulant, oil replacement, Sodium hypochlorite, Sodium hydroxide; anti-scalant) – Rs. 572 lakhs

Spares, tools & tackles, membrane, filtering media, pump motors, suction strainers, pressure tubes, measuring instruments – Rs. 750 lakhs

<table>
<tr><th>Particulars</th><th>Pre-Treatment + Biological</th><th>RO</th><th>Evaporator</th></tr>
<tr><td>Chemicals</td><td>259.19 lakh</td><td>268.13 lakh</td><td>44.69 lakh</td></tr>
<tr><td>Spares, tools & tackles, membrane etc.</td><td>109.76 lakh</td><td>274.39 lakh</td><td>365.85 lakh</td></tr>
</table>
</td><td>1322</td><td>1057.60</td><td>1123.70</td></tr>
<tr><td>2</td><td>Steam Generation Equipment</td><td>Consumables like coal (@ 1.5 kg coal @ Rs. 3.5/kg) per unit of power generated</td><td>604.80</td><td>483.84</td><td>514.08</td></tr>
<tr><td>3</td><td>Drier</td><td>Consumables like bearings, rollers, sheets @ Rs.3,00,000 per month</td><td>36.00</td><td>28.8</td><td>30.6</td></tr>
<tr><td>4</td><td>Testing Facility</td><td>Stationery, testing chemicals like sodium hydroxide, sulphuric acid, etc. @ Rs.50,000 per month.</td><td>6.00</td><td>4.8</td><td>5.1</td></tr>
</table>

S. No.	Facility	Particulars	Amount (@ 100% C.U. in Rs. Lakh)	Amount (@ 80% C.U. in Rs. Lakh)	Amount (@ 85% C.U. in Rs. Lakh)
5	**Administrative facility**	Stationery and office equipment related consumables etc. @ Rs.50000 per month.	6.00	4.8	5.1
		Total	1974.80	1579.84	1678.58

8.2.2. Manpower requirements

The total manpower requirement for the project would be about 133 persons. The details of monthly and yearly expenses for manpower required for running the project is provided in the following tables. The immediately following tabulation presents expenditures related to "direct" salary and wage related expenditures. This component of annual salary bill amounts to Rs.151.20 lakh.

Table 19: Expenditure related to salary and wages (direct and shop-floor expenses)1

S. No	Designation	No. of Persons	Salary per month per person (in Rs.)	Total Salary per month (in Rs.)	Salary p.a. (in Rs. lakh)
Common Effluent Treatment Plant					
1	General Manager	1	150000	150000	1800000
2	Manager (shift)	3	50000	150000	1800000
3	Operator	12	15000	180000	2160000
4	Helpers	18	10000	180000	2160000
Sub-total			**225000**	**660000**	**7920000**
Steam Boiler					
7	Maintenance Supervisor	1	20000	20000	240000
8	Electricians	1	15000	15000	180000
9	Fitters	1	10000	10000	120000
10	Operators	1	15000	15000	180000
11	Helpers	5	10000	50000	600000
Sub-total			**70000**	**110000**	**1320000**
Dryer Facility					
12	Operator	12	15000	180000	2160000
13	Helpers	24	10000	240000	2880000
Sub-total			**25000**	**420000**	**5040000**
Testing Facility					
14	Lab-in-charge	1	25000	25000	300000
15	Lab Technicians	1	15000	15000	180000
16	Lab Assistants	3	10000	30000	360000
Sub-total			**50000**	**70000**	**840000**
Grand Total		84	**370000**	**1260000**	**15120000**

The table following summarizes expenses towards salaries and wages for indirect-cost components, that is, for specifically administrative and related overheads. The annual salary bill on this count amounts to Rs.78 Lakh.

[1]As a matter of fact, salary is inclusive of fringe benefits. In the context of the developmental nature of the project, salaries have been pegged to the extent of even 30per cent above local market rates in the light of the developmental agenda of the SPV.

Table 20: Expenditure related to salaries and wages (indirect expenses related to administrative and support staff)

S. No	Designation	No. of Persons	Salary per month per person (in Rs.)	Total Salary per month (in Rs.)	Salary p.a. (in Rs. lakh)
1	Chief Operating Officer	1	50000	50000	600000
2	Warehouse Manager	1	20000	20000	240000
3	Warehouse supervisors	2	15000	30000	360000
4	Daily workers/Helpers	10	10000	100000	1200000
5	Accountants	3	25000	75000	900000
6	Receptionist	1	10000	10000	120000
7	Common Electrician	3	15000	45000	540000
8	Common Plumber	3	15000	45000	540000
9	Common Mechanic	3	15000	45000	540000
10	Security Personnel	15	10000	150000	1800000
11	Weighbridge operators	2	15000	30000	360000
12	Clerical, Computer staff & Office Assistants	5	10000	50000	600000
Total		**49**	**210000**	**650000**	**7800000**

The total expense on manpower is therefore projected at Rs.19.10 Lakh per month or Rs.229.20 Lakh per annum.

8.2.3. Utilities

The more important utilities required by the project comprise power supply and water.

8.2.4. Power

The broad asset-wise requirement of power for operation of machinery as well as critical air-conditioning equipment for smooth operation of equipment is presented in this sub-section.

8.2.5. Machine and equipment-wise requirement of power

The table below elaborates on the machine and equipment-wise power requirement in the proposed common facilities. The drawn power may be conservatively assumed at 80 per cent of the connected load in the case of different operating facilities and machine shop-floor. The co-gen plant will generate necessary power largely to operate the common facilities. The annexure 11 represents detailing of power and energy requirements.

Table 21: Machine and equipment (facility) -wise power requirement

S. No	Machinery & Equipment	Power requirement per m/c in kVA	Drawn power at 80% in kWh
CETP+ RO + Multiple Effect Evaporator - (ZLD CETP) - See attachment			
1	CETP-ZLD	1320	911
Total		**1320.00**	**911**
Dryer Facility			
1	Dryers (4 No.s)	500	320
Total		**500**	**320**

S. No	Machinery & Equipment	Power requirement per m/c in kVA	Drawn power at 80% in kWh
Co-gen Facility			
1	Co-gen	450	252
Total		**450**	**252**
Testing Facility			
1	Testing Lab (including air-conditioning)	50	26
Total		**50**	**26**
Admin Facility			
1	Admin Facility	148	71.04
Grand-total		**2468**	**1580**

From the table presented, it is evident that:

- The power requirement for operation of core machinery and equipment and administrative facilities is 2468 KVA. The total fixed charge, i.e., connected load of 2468 kVA @ Rs. 300 p.m. Amounts to Rs. 7.40 lakhs per month.

The table presented summarizes the envisaged annual expenditure in terms of power related charges.

Table 22: Annual expenditure statement vis-à-vis power charges

Sl. No.	Expenditure component	Particulars	Amount per annum (@ 100% C.U. in Rs. Lakh)	Amount per annum (@ 80% C.U. in Rs. Lakh)	Amount per annum (@ 85% C.U. in Rs. Lakh)
1	Fixed monthly connection charge (minimum connected load) – 2468 kVA	- Shop-floor as well as administrative facilities	Rs. 88.80/annum	88.80	88.80
2	Variable charges	Shop-floor as well as administrative facilities	-	-	-
	Total			88.80	88.80

8.2.6. Electricity transmission & distribution

Required power will be conveniently drawn from existing lines and stations located in the region. The power generated by the co-gen steam boiler is believed to be adequate to meet the requirement of the project (which is a drawn power of barely 1.6 MW)

8.2.7. Water Supply

Water charges may be presently pegged @ Rs. 25/KL or per 1000 litres for purposes of conservativeness in project cost estimation. The water requirement is envisaged at 1.5 MLD per day for the facility. At Rs.25 per 1000 litres, the relevant cost is about Rs.37,500 per day. This works out to be Rs.11250000 per annum.

8.2.8. Annual repairs and maintenance expense

The annual repairs and maintenance expenses have been pegged at Rs.160 Lakh. These are based on judgment and expert estimates. The O & M charge for operating the facility is as follows:

Table 23a: Annual repairs and maintenance expenditure

S. No.	Component	Particulars	Amount (@ 100% C.U. in Rs. Lakh)	Amount (@ 80% C.U. in Rs. Lakh)	Amount (@ 85% C.U. in Rs. Lakh)
1	Repairs and maintenance	Conservative lump-sum estimate	160.00 (including O & M @ Rs. 1 crore per annum)	160.00	160.00

Table 24: Sludge Management

S. No.	Component	Particulars	Amount (@ 100% C.U. in Rs. Lakh)	Amount (@ 80% C.U. in Rs. Lakh)	Amount (@ 85% C.U. in Rs. Lakh)
1	Sludge Management	3 types of sludge will be generated namely sodium sulphate salt (reusable), sodium chloride (reusable), Biological sludge – 24 tons/day (with 25% solid waste content on dry weight basis or 6 ton/day at the disposal rate to dumping site of Rs. 7000 per ton as per TNPCB norms or Rs. 48000/day x 300 days = Rs. 1.44 crore)	144.00	115.20	122.40

8.2.9. Insurance and other miscellaneous administrative expenses

Asset insurance is computed on the basis of 0.50 per cent on the value of concerned fixed assets. Cost by way of insurance will basically remain a fixed cost. Miscellaneous administrative related overheads are pegged at a lump-sum of Rs.60.00 Lakh per year. In the interest of conservativeness in project preparation, this cost is also considered to be basically fixed irrespective of scale of operation.

Table 25: Insurance and miscellaneous administrative expenses

S. N	Head	Particulars	Amount (@100% C.U.in Rs. Lakh)	Amount(@ 80%C.U.in Rs. Lakh)	Amount(@ 85%C.U.in Rs. Lakh)
1	Insurance	Estimate @ 0.50 % on fixed assets (such as plant and m/c and building including related contingency expenses of approx. Rs.14181.13 lakh)	70.91	70.91	70.91
2	Misc. Exp.	Stationery, communication, travelling and other misc. overheads	60.00	60.00	60.00
		Total	130.91	130.91	130.91

8.3. Working capital requirements

Working capital has been considered in terms of one month's expenditure requirements.

Table 26: Assessment of working capital

S. No.	Particulars	Annual expenditure at installed capacity of 100% (in Rs. Lakh)	Annual expenditure at operating capacity of 80% (in Rs. Lakh)	Annual expenditure at operating capacity of 85% (in Rs. Lakh)
1	Consumables (including boiler fuel and membrane replacement)	1974.8	1579.84	1678.58
2	Salary and wages (direct expenses)	151.2	120.96	128.5
3	Salary and wages (indirect expenses)	78	78	78
4	Utilities (power – fixed charges)	88.8	88.8	88.8
5	Utilities (power – variable charges)	-	-	-
6	Utilities (water – essentially fixed consumption)	112.5	112.5	112.5
7	Repairs and maintenance	160	160	160

S. No.	Particulars	Annual expenditure at installed capacity of 100% (in Rs. Lakh)	Annual expenditure at operating capacity of 80% (in Rs. Lakh)	Annual expenditure at operating capacity of 85% (in Rs. Lakh)
8	Sludge Management	144	115.2	122.4
9	Insurance	70.91	70.91	70.91
10	Misc. expenditure	60	60	60
	Total	2840.21	2386.21	2499.69

As the project achieves break-break-even in the first year of activity, working capital margin for this year is considered for estimation of project cost. Essentially, the total necessary working capital (one month's operating expense) requirement for the project at 80 % capacity utilisation is Rs.198.45 Lakh as per details presented. Further, total working capital required at an operating capacity of 85% works out to Rs.208.31 Lakh. In this context, the corresponding working capital margin requirement at 80% and 85% capacity utilisation amounts to Rs.49.71 Lakh and Rs.52.08 Lakh respectively, and the corresponding loan amounts at Rs.149.14 lakh and Rs.156.23 Lakh respectively. The interest on bank loan (@ 13 per cent per annum) amounts to Rs.19.39 Lakh at 80 per cent capacity utilisation and Rs.20.3 Lakh at an operating capacity of 75 per cent. As mentioned, the Bank is willing to offer in-principle sanction for required working capital to the project. Computation of working capital and margin money requirement for 10 years is detailed below.

Table 27: Computation of Working Capital and Margin Money requirements[2]

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
Consumables, etc. Other recurring exp.	1579.84	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58
Manpower (direct)	120.96	128.50	128.50	128.50	128.50	128.50	128.50	128.50	128.50	128.50	128.50	128.50	128.50	128.50	128.50
Manpower (indirect)	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00
Electricity charges (fixed)	88.80	88.80	88.80	88.80	88.80	88.80	88.80	88.80	88.80	88.80	88.80	88.80	88.80	88.80	88.80
Electricity charges (variable)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Water charges	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50
Repairs & maintenance	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00
Sludge Management	115.20	122.40	122.40	122.40	122.40	122.40	122.40	122.40	122.40	122.40	122.40	122.40	122.40	122.40	122.40
Insurance	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91
Misc. Adm. Expenses	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
Total	2,386.21	2,499.69	2,499.69	2,499.69	2,499.69	2,499.69	2,499.69	2,499.69	2,499.69	2,499.69	2,499.69	2,499.69	2,499.69	2,499.69	2,499.69
Working capital (for 1 month's expenses)	198.85	208.31	208.31	208.31	208.31	208.31	208.31	208.31	208.31	208.31	208.31	208.31	208.31	208.31	208.31
Working capital margin[3]	49.71	52.08	52.08	52.08	52.08	52.08	52.08	52.08	52.08	52.08	52.08	52.08	52.08	52.08	52.08
Working	149.14	156.23	156.23	156.23	156.23	156.23	156.23	156.23	156.23	156.23	156.23	156.23	156.23	156.23	156.23

[2] Amounts in Rs. Lakh.

[3] @ 25% of working capital requirement.

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
capital loan[4]															
Interest on working capital loan @ 13 % p.a.	19.39	20.31	20.31	20.31	20.31	20.31	20.31	20.31	20.31	20.31	20.31	20.31	20.31	20.31	20.31

8.4. Depreciation estimates

Estimates of depreciation are non-cash expenditures and presented in this section on the basis of both Straight Line (SL) as well as WDV methods. Accounting for depreciation would facilitate sustainability of operations in terms of developing a fund for replacement of assets. The relevant fund that is accumulated could facilitate replacement of such assets towards the end of the most conservatively envisaged asset life of about 10 years. Depreciation of buildings is considered at the rate of 5 per cent per year, depreciation of plant and machinery at 10 per cent a year (envisaged project life of 10 years prior to replacement of assets) and depreciation of miscellaneous fixed assets also at the rate of 10 per cent a year as per the SL method.

Under the WDV method depreciation is considered at the rate of 10 per cent a year on buildings, 15 per cent on plant and machinery and 10 per cent on miscellaneous fixed assets.

The depreciated value of assets as per SL and WDV methods is presented in the tables following.

Table28: Depreciation employing the Straight Line Method[5]

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
Land	170.43	170.43	170.43	170.43	170.43	170.43	170.43	170.43	170.43	170.43	170.43	170.43	170.43	170.43	170.43
Building and civil works															
Opening Balance[6]	7,131.76	6,775.17	6,418.58	6,062.00	5,705.41	5,348.82	4,992.23	4,635.64	4,279.06	3,922.47	3,565.88	3,209.29	2,852.70	2,496.12	2,139.53
Less Depr. @ 5%	356.59	356.59	356.59	356.59	356.59	356.59	356.59	356.59	356.59	356.59	356.59	356.59	356.59	356.59	356.59

[4] @ 75% of working capital requirement.

[5] Amounts in Rs. Lakh.

[6] Opening balances includes provision for contingencies/escalation.

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
Closing Balance	6,775.17	6,418.58	6,062.00	5,705.41	5,348.82	4,992.23	4,635.64	4,279.06	3,922.47	3,565.88	3,209.29	2,852.70	2,496.12	2,139.53	1,782.94
Machinery and Equipment															
Opening Balance[7]	7,049.37	6,344.43	5,639.50	4,934.56	4,229.62	3,524.69	2,819.75	2,114.81	1,409.87	704.94	-	-	-	-	-
Less Depr. @ 10%	704.94	704.94	704.94	704.94	704.94	704.94	704.94	704.94	704.94	704.94	-	-	-	-	-
Closing Balance	6,344.43	5,639.50	4,934.56	4,229.62	3,524.69	2,819.75	2,114.81	1,409.87	704.94	-	-	-	-	-	-
Misc. Fixed Assets															
Opening Balance	100.00	90.00	80.00	70.00	60.00	50.00	40.00	30.00	20.00	10.00	-	-	-	-	-
Less Depr. @ 10%	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	-	-	-	-	-
Closing Balance	90.00	80.00	70.00	60.00	50.00	40.00	30.00	20.00	10.00	-	-	-	-	-	-
Opening Balance	14,451.56	13,380.04	12,308.51	11,236.99	10,165.46	9,093.94	8,022.41	6,950.89	5,879.36	4,807.84	3,736.31	3,379.72	3,023.13	2,666.55	2,309.96
Total Depr.	1,071.53	1,071.53	1,071.53	1,071.53	1,071.53	1,071.53	1,071.53	1,071.53	1,071.53	1,071.53	356.59	356.59	356.59	356.59	356.59
Depr. Value	13,380.04	12,308.51	11,236.99	10,165.46	9,093.94	8,022.41	6,950.89	5,879.36	4,807.84	3,736.31	3,379.72	3,023.13	2,666.55	2,309.96	1,953.37

[7] Opening balances includes provision for contingencies/escalation.

Table 29: Depreciation employing the WDV Method

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
Land	170.43	170.43	170.43	170.43	170.43	170.43	170.43	170.43	170.43	170.43	170.43	170.43	170.43	170.43	170.43
Building and civil works															
Opening Balance[8]	7,131.76	6,418.58	5,776.73	5,199.05	4,679.15	4,211.23	3,790.11	3,411.10	3,069.99	2,762.99	2,486.69	2,238.02	2,014.22	1,812.80	1,631.52
Less Depr. @ 10%	713.18	641.86	577.67	519.91	467.91	421.12	379.01	341.11	307.00	276.30	248.67	223.80	201.42	181.28	163.15
Closing Balance	6,418.58	5,776.73	5,199.05	4,679.15	4,211.23	3,790.11	3,411.10	3,069.99	2,762.99	2,486.69	2,238.02	2,014.22	1,812.80	1,631.52	1,468.37
Machinery and Equipment															
Opening Balance[9]	7,049.37	5,991.96	5,093.17	4,329.19	3,679.82	3,127.84	2,658.67	2,259.87	1,920.89	1,632.75	1,387.84	1,179.66	1,002.71	852.31	724.46
Less Depr. @ 15%	1,057.41	898.79	763.98	649.38	551.97	469.18	398.80	338.98	288.13	244.91	208.18	176.95	150.41	127.85	108.67
Closing Balance	5,991.96	5,093.17	4,329.19	3,679.82	3,127.84	2,658.67	2,259.87	1,920.89	1,632.75	1,387.84	1,179.66	1,002.71	852.31	724.46	615.79
Misc. Fixed Assets															
Opening Balance	100.00	90.00	81.00	72.90	65.61	59.05	53.14	47.83	43.05	38.74	34.87	31.38	28.24	25.42	22.88
Less Depr. @ 10%	10.00	9.00	8.10	7.29	6.56	5.90	5.31	4.78	4.30	3.87	3.49	3.14	2.82	2.54	2.29
Closing Balance	90.00	81.00	72.90	65.61	59.05	53.14	47.83	43.05	38.74	34.87	31.38	28.24	25.42	22.88	20.59
Total Depr.	1,780.58	1,549.65	1,349.75	1,176.57	1,026.45	896.20	783.13	684.87	599.44	525.09	460.33	403.89	354.65	311.67	274.11
Depr. Value	12,670.98	11,121.33	9,771.58	8,595.00	7,568.55	6,672.35	5,889.22	5,204.35	4,604.92	4,079.83					

[8] Opening balances includes provision for contingencies/escalation.

[9] Opening balances includes provision for contingencies/escalation.

Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
											3,619.50	3,215.61	2,860.95	2,549.29	2,275.18

8.5. Income estimates

In this DPR, estimates of income are projected on the basis of user charges to be levied for provision of various inputs and services to SPV member units and other cluster firms. The major income sources are envisaged by way of provision of CETP, drying and testing facilities.

As a matter of fact, emphasis has been on maintaining conservativeness in projection of incomes. The charges levied in some facilities in other locations who offer services are generally more than the charges pegged for this project. The circumstance substantiates the appropriateness of user charges levied as well as viability of the project.

The relevance and appropriateness of user charges is also evident from the fact that the rates prescribed help meet operating expenditures as well as provide for sustainable replacement of assets even while ensuring adequate profitability as required in a bankable DPR.

Charges and envisaged income accruals are presented in the table following.

Table 30: Projected annual income statement

S.No	Products	Particulars	User Charges @ 100% C.U.	User Charges @ 80% C.U.	User Charges @ 85% C.U.
1	CETP	6 MLD and user charge @ Rs. 300 per thousand litres or Rs. 300 * 6000 = Rs. 18 lakh per day or 4,50,00,000 per month	5400.00	4320.00	4590.00
2	Drying	Capacity of 24 TPD @ Rs. 10 per kg or Rs. 10000 per T or Rs. 2,40,000 per day or Rs. 60 lakh per month	720.00	576	612
3	Testing lab facility	Fabric tensile tester for 10 tests @ Rs. 100 per test or Rs. 1000 per day; Washing/ fastener (against washing) tester for 10 tests per day @ Rs. 150 per test or Rs. 1500 per day; Lab dyeing machine test or 10 tests per day @ Rs. 300 per test or Rs. 3000 per day; Yarn count aid CSP (Strength) testing for 20 tests per day @ Rs. 100 per test or Rs. 2000 per day; Colour Fastness (against sunlight) for 10 tests per day @ Rs. 150 per test or Rs. 1500 per day; Fabric shrinkage (against washing and dyeing) for 30 tests per day @ Rs. 200 per test or Rs. 6000 per day	42	33.6	35.7
4	Earning from sale of recovered Salt	Earning from sale of recovered Salt @ Rs. 25 TPD or 20 TPD (incl. losses over handling/drying etc.) @ Rs. 8 per kg or Rs. 1.6 lakh per day or Rs. 480 lakh	480.00	384.00	408.00
5	Sale of recovered water	Sale of recovered water @ Rs. 6 metre cube x 6000 cubic metre or Rs. 36000 per day	108.00	86.40	91.80
	Total		6750.00	5400.00	5737.50

Essentially, total gross revenue in-flow therefore works out to Rs.5400.00 lakh per annum on the basis of operating capacity (on three shift basis) of 80 per cent. Three shift basis has been considered as facilities such as par boiling and SE is operated continuously typically.

For projection purposes, operating capacity of 80% is considered for the first year of operations, and 85% subsequently.

8.6. Estimation of profitability: Income and Expenditure statement

Statement of income and expenditure has been prepared on the basis of estimates above. Projections have been made for a period of 10 years.

Table 31: Estimation of profitability: Income and expenditure statement[10]

S. No.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
	No: of working days	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
	No: of shifts	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Capacity utilisation in %	**80%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**
A	**Income (user / service charge)**	5400	5737.50	5737.50	5737.50	5737.50	5737.50	5737.50	5737.50	5737.50	5737.50	5737.50	5737.50	5737.50	5737.50	5737.50
B	**Expenditure (annual cost of production)**															
	Consumables	1579.84	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58	1678.58
	Manpower (direct)	120.96	128.52	128.52	128.52	128.52	128.52	128.52	128.52	128.52	128.52	128.52	128.52	128.52	128.52	128.52
	Utilities (power – fixed charges)	88.80	88.80	88.80	88.80	88.80	88.80	88.80	88.80	88.80	88.80	88.80	88.80	88.80	88.80	88.80
	Utilities (power – variable charges	-	-	-	-	-	-	-	-	-	-					
	Utilities (water – fixed	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50	112.50
	Repairs & maintenance	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00
	Sludge Management	115.20	122.40	122.40	122.40	122.40	122.40	122.40	122.40	122.40	122.40	122.40	122.40	122.40	122.40	122.40

[10] Amounts in Rs. Lakh.

S. No.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
	Depreciation	1,071.53	1,071.53	1,071.53	1,071.53	1,071.53	1,071.53	1,071.53	1,071.53	1,071.53	1,071.53	356.59	356.59	356.59	356.59	356.59
	Total Cost of production	**3,248.83**	**3,362.33**	**3,362.33**	**3,362.33**	**3,362.33**	**3,362.33**	**3,362.33**	**3,362.33**	**3,362.33**	**3,362.33**	2,647.39	2,647.39	2,647.39	2,647.39	2,647.39
C	**Administrative expenses.**															
	Manpower (indirect)	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00	78.00
	Insurance	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91	70.91
	Misc. Exp.	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
	Total Admn exp.	**208.91**	**208.91**	**208.91**	**208.91**	**208.91**	**208.91**	**208.91**	**208.91**	**208.91**	**208.91**	**208.91**	**208.91**	**208.91**	**208.91**	**208.91**
D	**Financial expenses Working capital loan (@ 13 %) interest**	19.39	20.31	20.31	20.31	20.31	20.31	20.31	20.31	20.31	20.31	20.31	20.31	20.31	20.31	20.31
	Term loan (@ 13 %) interest	193.45	174.11	154.76	135.42	116.07	96.73	77.38	58.04	38.69	19.35	-	-	-	-	-
Total Financial Expenses		212.84	194.42	175.07	155.73	136.38	117.04	97.69	78.35	59.00	39.66	20.31	20.31	20.31	20.31	20.31
E	**Total Expenses B+C+D**	3,740.58	3,765.65	3,746.31	3,726.96	3,707.62	3,688.27	3,668.93	3,649.58	3,630.24	3,610.89	3,591.55	3,591.55	3,591.55	3,591.55	3,591.55
F	**Profit (A-E)**	1,659.42	1,971.85	1,991.19	2,010.54	2,029.88	2,049.23	2,068.57	2,087.92	2,107.26	2,126.61	2,860.89	2,860.89	2,860.89	2,860.89	2,860.89
G	**P&P exp. written off**	70.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00	-	-	-	-	-
H	**Income tax (provision @ 30.90%)**[11]	272.03	439.93	507.68	567.17	619.53	665.76	706.67	743.01	775.39	804.34	851.96	869.40	884.61	897.90	909.50
I	**Net profit for the year**	1,317.39	1,461.92	1,413.51	1,373.37	1,340.35	1,313.47	1,291.90	1,274.91	1,261.87	1,252.27	2,008.93	1,991.49	1,976.28	1,963.00	1,951.39

[11] See following table.

S. No.	Particulars	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15
J	**Cumulative Surplus**	1,317.39	2,779.31	4,192.82	5,566.19	6,906.54	8,220.01	9,511.91	10,786.82	12,048.69	13,300.96	15,309.89	17,301.38	19,277.66	21,240.66	23,192.05

Evidently, project economics are sound as a cumulative surplus of about Rs. 23,192.05 lakh is earned by project stakeholders even after accounting for taxation and depreciation.

This surplus generated could also be used for further developmental activity of the Project SPV. It could also be deployed for expansion and subsequent upgrading activities.

Chapter 11: Project Impact

11.1. Benefits to industry from the project

Envisaged increase in productivity: in terms of production, turnover, economic value added (i.e. the value added in monetary terms from cost of raw material to finished goods sale price) as indicated in the value-chain mapping is elaborated in this sub-section. The project is expected to enable:

- The project could contribute towards even increasing cluster turnover by over 100 per cent in a 5 year time-frame as turnover growth rate could increase from 10 to atleast 20 per cent per annum.
- The project is to facilitate even more competitive orientation of MSE cluster units in the Madurai Belt vis-à-vis firms in large clusters (Tiruppur, Karur and Erode)

Present and potential value-accruals-

Presently, cluster firms or source towel fabric (mix of 3 types of yarns – 2/2-s, 10s and 16s) of 24x48" size of about 300 gms weight @ Rs. 46 per towel. This is the gross value on procurement or receipt of grey towel fabric of 300 gms in weight. Upon processing (and meeting effluent treatment expenses) and stitching and packaging bleached or dyed fabric, the value of the fabric increases to Rs. 74.75. The profit accrues to processors is barely 3-5 per cent per towel. The product is sold to customers @ Rs. 98 and on to consumers @ Rs. 150. Also, the time taken is 3 days per batch. Upon advancing from traditional technologies to soft flow technology (with CETP, Co-gen and common dryer facilities), profit margins may increase to even 15-20 per cent and time per batch will be reduced to barely 1 day.

11.2. Impact on Employment: creation of direct and indirect jobs

Ensuring sustainable employment opportunities for the thousands of Labour force in the cluster (scope for directly increasing empl. by at least 2000 persons in 5 years; increasing capacity utilization of cluster firms by at least 20 per cent.

11.3. Projected social and economic impact

- The project will contribute to a greater degree of environmental compliance.
- It will also contribute indirectly towards the growth of many other forward and backward linkaged clusters in Tamil Nadu.
- Upgrading profitability of cluster firms as deployment of more globally competitive technologies will be enabled.

36 SPV members are directly involved with the project and will be beneficiaries; related facilities will also be open for use by non-members. Hence, units across the region will be benefited

11.4. Value addition

Impact in terms of value-chain has been already elaborated upon. Value addition and hence profit margins could increase from barely 3-5 per cent on sale to even 15-20 per cent on sale in a time frame of 3-5 years.

11.5. Estimated investments and turnover

Evolution of integrated industrial infrastructure for 36 units which will facilitate relocation and new investment of at least about Rs. 50 crore. Cluster turnover of all firms in the cluster in the Madurai belt could rise from Rs. 460 crore in 2014-15 to Rs. 950 crore in 2018-19.

Table-1: Indicative O&M cost projections on per cu.mt basis (for ZLD)

Fixed / Variable	Item Description	Pre-Treatment + Biological	RO	Evaporator	Total (Rs./cu.m) ZLD
Fixed	Manpower (Fixed)	-	-	-	4.29
	Energy	0.4	1.3	0.9	2.61
	Maintenance (including O & M charges)	-	-	-	9.00
Total Fixed Cost					15.90
Variable	Chemicals	14.5	15.0	2.5	32.00
	Manpower (Variable)	1.2	1.0	2.2	4.36
	Energy	6.0	17.0	12.0	35.00
	Steam (Fire wood)	-	-	22.0	22.00
	Replacement Cost (UF, RO and NF membranes)	6.0	15.0	20.0	41.00
	Sludge disposal cost	8.0	-	-	8.00
Total Variable Cost (Rs./cu.m)					**142.36**
Total (Rs./cu.m)					**158.26**

Table-2: Indicative O&M cost projections on per cu.mt basis (for 6 MLD ZLD) after water and salt recovery

Fixed / Variable	Item Description	Pre-Treatment	RO	Evaporator	Total (Rs./cu.m) - ZLD
Fixed	Manpower (Fixed)	1.1	1.1	2.1	4.29
	Energy	0.4	1.3	0.9	2.61
	Maintenance	-	-	-	9.00
Total Fixed Cost					15.90
Variable	Chemicals	14.5	15.0	2.5	32.00
	Manpower (Variable)	1.2	1.0	2.2	4.36
	Energy	6.0	17.0	12.0	35.00
	Steam (Fire wood)	-	-	22.0	22.00
	Replacement Cost (UF, RO and NF membranes)	6.0	15.0	20.0	41.00
	Sludge disposal cost	8.0	-	-	8.00
Total Variable Cost (Rs./cu.m)					**142.36**
Total Operating cost (Rs./cu.m)					**158.26**
Recoveries	Cost of Recovered water (@ Rs.3.0 with 97% recovery)				3
	Cost of Recovered salt (with 70% recovery of 35 tons salt) @ Rs. 8 / kg				32
Total recovery savings (Rs./cu.m)					**35**
Net Operating cost (Rs./cu.m)					**123.26**

Table-3: Indicative O&M cost projections on per cu.mt basis (for 6 MLD ZLD)b after implementation of CPP

Fixed / Variable	Item Description	Pre-Treatment	RO	Evaporator	Total (Rs./cu.m) - ZLD
Fixed	Manpower (Fixed)	1.1	1.1	2.1	4.29
	Energy	0.4	1.3	0.9	2.61
	Maintenance	-	-	-	9.00
Total Fixed Cost					15.90
Variable	Chemicals	14.5	15.0	2.5	32
	Manpower (Variable)	1.2	1.0	2.2	4
	Energy	6.0	17.0	12.0	0
	Steam (Fire wood)	-	-	22.0	33
	Replacement Cost (UF, RO and NF membranes)	6.0	15.0	20.0	41
	Sludge disposal cost	8.0	-	-	8.00
Total Variable Cost (Rs./cu.m)					**118.36**
Total Operating cost (Rs./cu.m)					**134.26**
Recoveries	Cost of Recovered water (@ Rs.3.0 with 97% recovery)				3
	Cost of Recovered salt (with 70% recovery)				32
	Savings from CPP (Rs./cu.m)				**24 - already considered in terms of savings in cost of variable power**
total savings					**35**
Net Operating Cost (Rs./cu.m)					**99**

ESTIMATED FINANCIAL IMPACT OF ZLD FOR 6 MLD CETP, MADURAI

S.No	Items Description	Value
1	Capacity of the CETP (cu.m/day)	6000
2	Water consumption for dyeing (Litres/Kg)	50
3	Total Production capacity (Tons /Day)	120
4	Production cost of Terry towel(Rs/Kg)	327
5	Production Cost (INR.Lakhs/day)	392
6	O&M Cost of ZLD system – Rs. / Cu.m)	158
7	Cost of ZLD system for 6 MLD W/o recoveries (Rs. Lakhs/day)	9.5
8	Cost of ZLD for Terry towel– Rs / kg (W/o recovery)	7.9
9	Cost of ZLD for Terry towel– Rs / Piece(W/o recovery)	2.4
10	**% of ZLD cost on processing cost of dyed fabric (W/o recovery)**	**2%**
11	**RECOVERIES:**	
12	Cost of Water – Rs. / KL	3.00
13	Cost of Sodium Sulphate salt – Rs./ Kg	8
14	Water @ Rs. 3.0 /KL with 97% recovery)	2.91
15	Salt (with 67% recovery)	30.3
16	Total Recovery	33.2
17	Net Cost of ZLD system (Rs./cu.m)	125
18	Cost of ZLD system @ Rs.125/cu.m net for 6 MLD (Rs. Lakhs/day)	7.5
19	Cost of ZLD for Terry towel Rs. /Kg (with recovery)	6.25
20	Cost of ZLD for Terry towel– Rs / Piece (with recovery)	1.88
21	**% of ZLD cost on Production cost of Terry towel (After recovery)**	**1.91%**
22	Savings in energy cost Rs./kWhr @1.6	6.4
23	Savings in steam cost Rs./Kg @0.9	19.8
24	Total Savings (Rs./cu.m)	26
25	Net O&M cost with Recoveries and Savings from CPP, Rs./cu.m	99
26	Cost of ZLD system @ Rs.117/cu.m net for 6 MLD (Rs. Lakhs/day)	5.93
27	Cost of ZLD for Terry towel– Rs / Kg(with recovery and CPP)	4.94
28	Cost of ZLD for Terry towel– Rs / Piece (with recovery and CPP)	1.48
29	**% of ZLD cost on Production cost of Terry towel (After recovery and savings from CPP)**	**1.51%**

Rain Water Harvesting and Storm Water Management Cost

No. of Percolation Pits = 169

Cost of construction of 1 Percolation Pit = Rs. 15,000

Total cost = 169 x 15000 = Rs. 25,35,000

No of Check Dams = 2

Cost of construction per Check dam = Rs. 2,00,000

Total Cost = 2 x 200000 = Rs. 4,00,000

Total Cost of Construction = Rs. 29,35,000 = Rs. 29.35 Lakhs

Annexure – III

Hydrological Study

HYDROGEOLOGICAL REPORT

HYDROGEOLOGICAL STUDIES AT COMMON EFFLUENT TREATMENT PLANT (CETP) FOR A TEXTILE PROCESSING CLUSTER NEAR KARIYAPATTI, VIRUDHUNAGAR DISTRICT.

CLIENT NAME:

SOUTHERN DISTRICT TEXTILE PROCESSING CLUSTER (P) LIMITED

SDTPC

PREPARED BY:

DEPARTMENT OF CIVIL ENGINEERING
ANNAMALAI UNIVERSITY
ANNAMALAINAGAR

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1. INTRODUCTION

1.1. BACKGROUND & PURPOSE OF THE PROJECT

M/s. Southern District Textile Processing Cluster (P) Limited (herein after referred to as SDTPCPL) proposed to establish an Industrial Estate exclusively for Textile Processing, with an in-house Common Effluent Treatment Plant (CETP) and a Captive Power Plant (CPP) in the villages of Pottalkulam and Tamaraikulam, Kariyapatti Taluk in Virudhunagar District, Tamil Nadu. The total area of the proposed project is 40.65 hectares (100.46 acres).

The 36 industries that are promoting the cluster are at present located in the districts of Madurai, Virudhunagar, Sivagangai and Dindigul. These industries have been experiencing difficulties in treating their effluents. Therefore, the establishment of this industrial cluster will not only help in mitigating the environmental problems of disposing the effluents but will also provide a new lease of life to these industries. It will help in safeguarding the livelihood of thousands of workers who are employed in these units.

The available source of water in & around the project area is mainly the groundwater. To utilize groundwater, permission from State Environmental Impact Assessment Authority (SEIAA) is required for which, a study of hydro-geological conditions in the project area is essential to be conducted. For this SDTPCPL has entrusted Department of Civil Engineering, Annamalai University to conduct the hydrogeological study.

The Department of Civil Engineering, Annamalai University has been assigned to conduct the hydrogeological study in the Common Effluent Treatment Plant (CETP) for a Textile Processing cluster near Kariyapatti, Virudhunagar District. The Fieldwork was carried out on 11th June 2017 by M/s Linga Research and Consultancy Services, Chidambaram. An action plan for ground water conditions in the study area was prepared. The objective of the present study is to assess the availability of groundwater, to recommend the suitable borehole drilling site and comment on aspects of depth to potential aquifers, aquifer availability and type, possible yields and water quality. For this purpose all available hydrogeological information for the area has been analyzed, and a geophysical survey was also conducted.

The investigations involved ground water level measurement, geophysical field investigations, assessing competing user of groundwater and a detailed desk study in which the available relevant geological and hydrogeological secondary data were collected, analyzed, collated and evaluated within the context of the SDTPCPL requirement. The finding of hydrogeological study is summarized in this report.

2. BACKGROUND INFORMATION

2.1. LOCATION

The proposed Textile Processing Cluster is intended to be developed in an area of 40.65 hectares (100.46 acres) at Virudhunagar District. The SDTPCPL is situated in between A. 9°36'28.09" N 78°11'51.80" E. B. 9°36'36.53" N 78°12'08.52" E. **C.** 9°36'22.08" N 78°12'16.52" E. **D.** 9°36'20.34" N 78°12'04.34" E. The elevation of the area 73 m Above Mean Sea Level (AMSL) and site is bounded by Pottalkulam and Tamaraikulam village, Kariyapatti Taluk.

Nearest Highway Road: Kariyapatti - Narikkudi Road, 4.71 km, NNE Tiruchuli Road, 5.16 km, SW.

Rail Linkage: Tiruchuli Railway Station, 7.5 km, South

Nearest Airport: Madurai International Airport, 28.08 km, NNW

Topography: The topography of the proposed plant site and surrounding area is flat.

The project location is marked on Layout map as shown in ***Figure 1.***

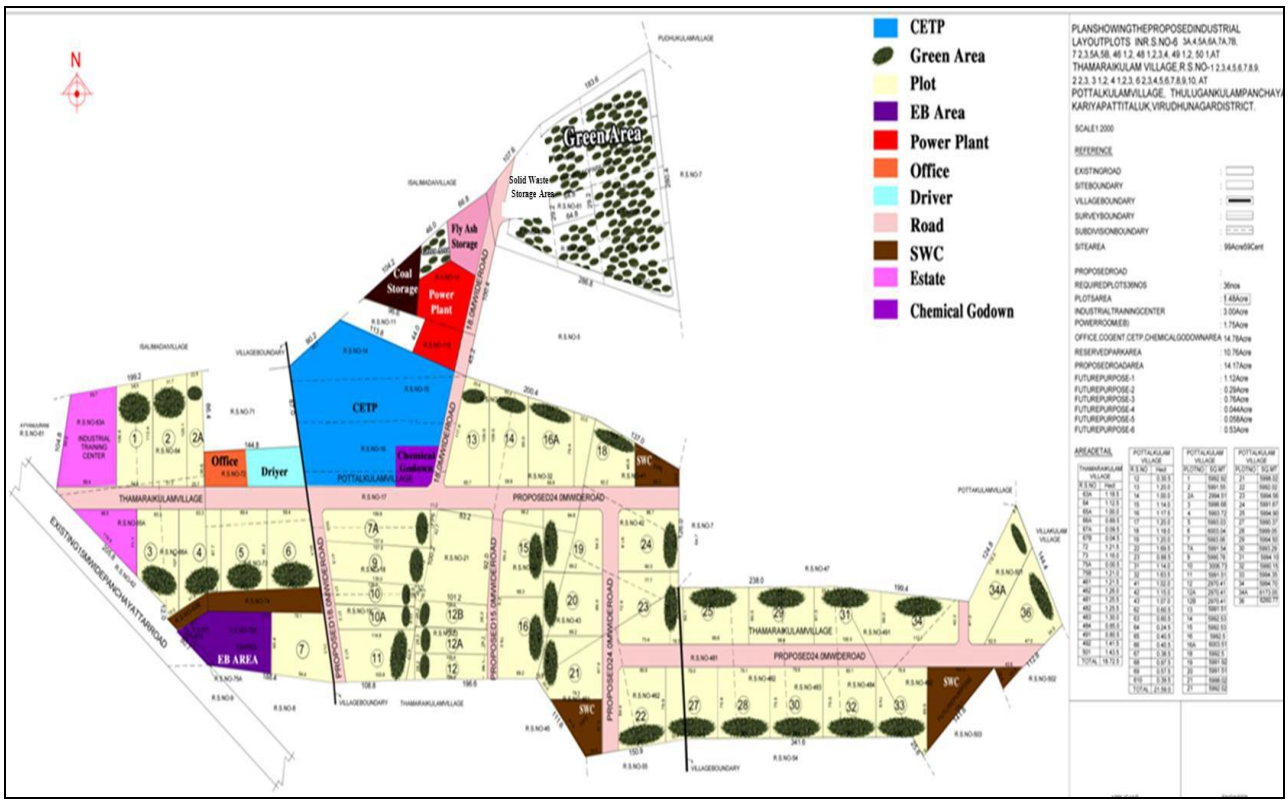

FIGURE 1: PLANT LAYOUT MAP

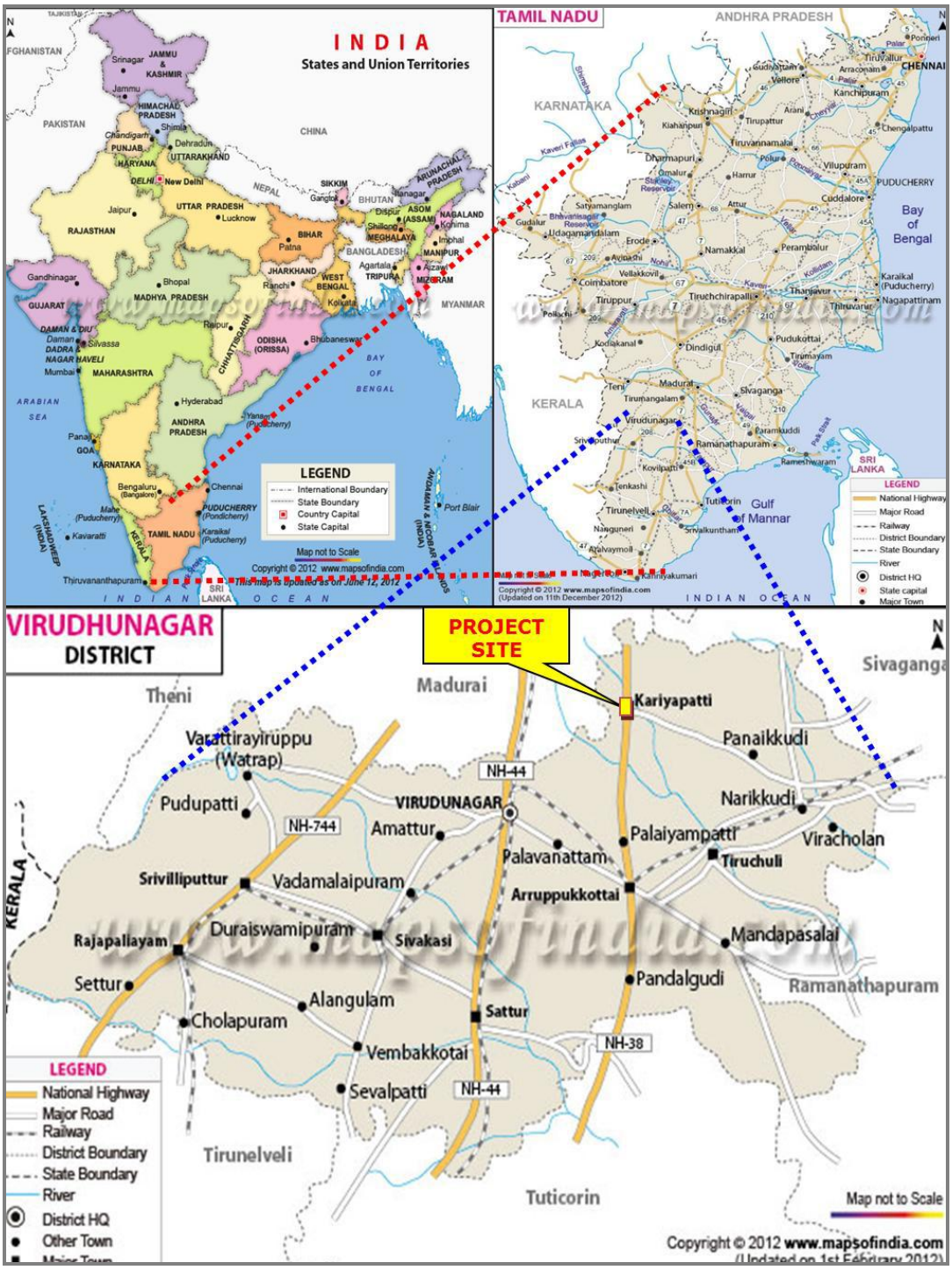

FIGURE 2: INDEX MAP

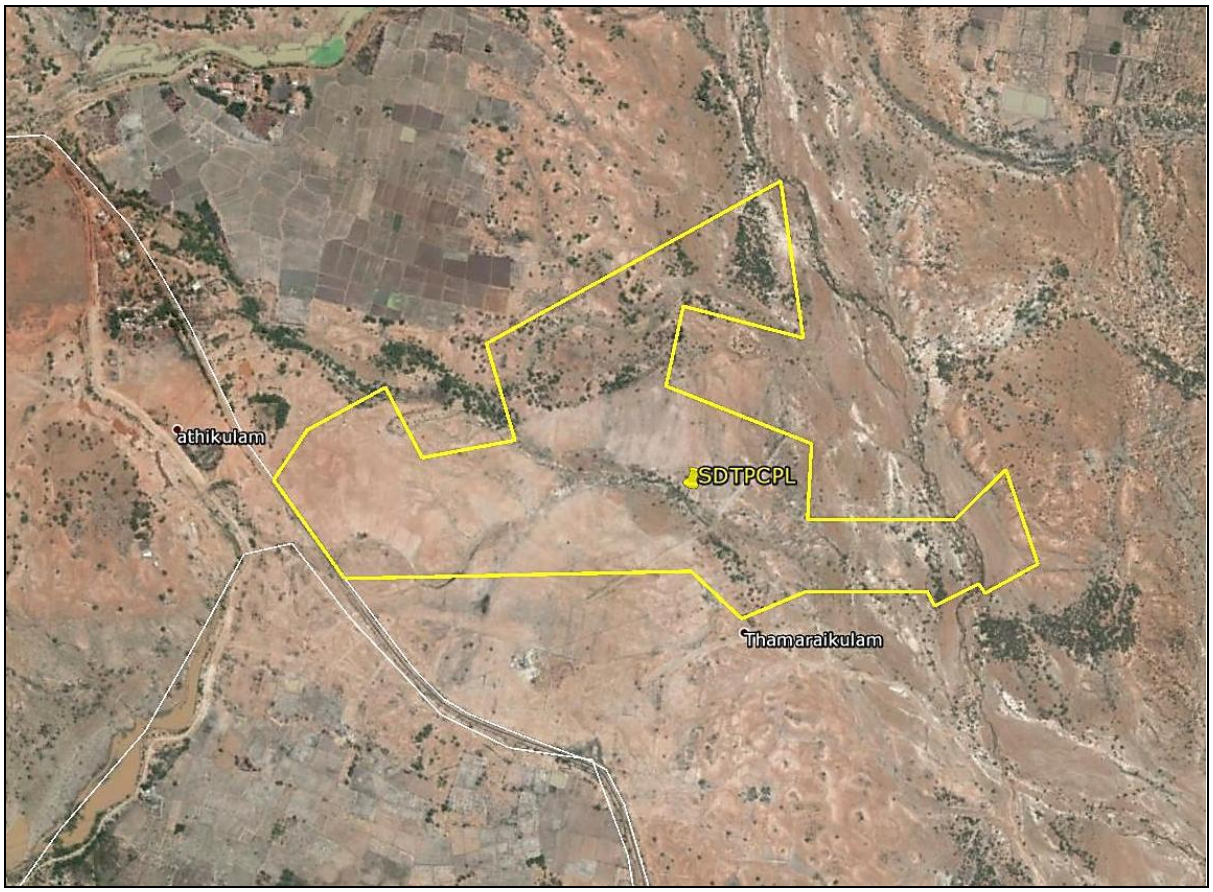

FIGURE 3: AERIAL VIEW OF THE PROPOSED PROJECT SITE

2.2. CLIMATE

Semi-arid tropical monsoon is prevalent in this region with high mean temperature and a low degree of humidity. Most of the precipitation occurs in the form of cyclonic storms caused due to the depressions in Bay of Bengal. The southwest monsoon rainfall is highly erratic and summer rains are negligible. Rainfall data from the normal annual rainfall over the district varies from about 724 to 913 mm. It's minimum around Sathur in the southeastern part of the district. It gradually increases towards west, north and northwest and attains a maximum around Watrap.

The district enjoys a subtropical climate. The period from April to June is generally hot and dry. The weather is pleasant during the period from November to January. Usually mornings are more humid than afternoons. The relative humidity is on an average between 65 and 85% in the mornings. Humidity in the afternoon is generally between 40 and 70%. The annual mean minimum and maximum temperatures are 23.78 and 33.95° C respectively. The daytime heat is oppressive and the temperature is as high as 40.2° C. The lowest temperature recorded is of the order of 19.3° C.

2.3. PHYSIOGRAPHY

2.3.1. BASIN AND SUB-BASIN

The Virudhunagar district is part of the composite east flowing river basin, “Between Gundar and Vaippar” as per the Irrigation Atlas of India. Vaippar, Arjuna River, Gundar, and Deviar, Nichibanadhi, Kovilur and Periyar are the important Sub-basins/Watersheds.

2.3.2. GEOMORPHOLOGY

The district is bordered by Western Ghats (Ridge and valley complex) in the West. Valley fill area is observed in Watrap block. A major part of the district constitutes a plain terrain with a gentle slope toward East and Southeast, except for the hilly terrain in the west. The predominant geomorphic units identified in the study area are 1) Flood plain 2) Bazada 3) Pediment, 4) Shallow and buried pediments and 5) Structural Hills depending on the environment of formation.

2.4. SOIL

Soils in the area have been classified into i) Deep red Loam ii) Black soil iii) Red sandy soil. The majority of the study area is covered by Black soil. Ferruginous red soils are also seen at places. Alluvial soils occur along the river courses. Red sandy soil is seen all around the Sattur, Kariyapatti, Aruppukotai and Tiruchuli blocks.

2.5. DRAINAGE

The major part of Virudhunagar district falls in Vaippar - Gundar river basin. Vaippar, Arjuna River, Gundar and Deviar are the important rivers. The drainage pattern, in general, is dendritic. All the rivers are seasonal and carry substantial flows during monsoon period. Vaippar, which is one of the important rivers of the district, flows and drains in the Vembakkam and Sattur blocks. The Arjuna River, flowing in the central part of the district, has its origin from the Sattur Watrap Hills and is formed by Kovillar, periyar and Chittar rivers. The Gundar River originates at an altitude of 500 m AMSL near Kottaimalai of Saptur reserve forest in Varushanadu hills in Madurai district.

2.6. GEOLOGY

2.6.1. REGIONAL GEOLOGY

Virdhunagar District comprises of Archaean Charnockite, unclassified genesis and Pleistocene Laterite. Wide patches of black soil with nodules of gypsum are recorded in parts of Virudhunagar and Tuticorin Districts. Black soils generally overlie calcrete/Kankar.

These are considered to be deposited in some inland marshy basins developed during the Quaternary.

TABLE 1: GEOLOGICAL SEQUENCE OF DISTRICT.

Rock Type	Geological Formation
Sedimentary Rock 90% Hard Rock 10%	ChGneiss, Charnockite, Quatrzite, Pegamatite, Laterite, Sandstone and Alluvium

Source: http://www.twadboard.gov.in

2.6.2. LIMESTONE

Limestone in Tamil Nadu occurs as crystalline and non-crystalline (amorphous) varieties besides corals. The bulk of limestone deposits are found to the south of Moyar - Bhavani - Attur Lineament and thus the southern districts form the limestone province. The crystalline limestones of Precambrian age are mainly distributed in parts of Virudhunagar and Ramanathapuram Districts.

2.6.3. GEOLOGY OF THE STUDY AREA AND PROJECT SITE

The geological formations of the study area are dominated by recent alluvium, sandstones, basic metamorphic rocks, limestones and charconites. Three bands of good quality limestone ranging in strike length from 1.5 to 6.5 km and upto 75 m wide occur near Pandalkudi, Palavanattam and Chinnayapuram of Virudhunagar District. In the Alangulam area, Virudhunagar District, three bands of good quality limestone extend over a strike length of up to 2.5 km. The reserves in these bands up to a depth of 10 to 15 m are of the order of 6.31 million tonnes. Lower Gundar river basin comprises hornblende biotite gneiss, mica gneiss, feldspathic gneiss, garnetiferous gneiss, pegmatite and quartzite. The regional foliation of these rocks varies from NNE-SSW to WNW- ESE and E-W directions with dip of SE, NE and south directions. These rocks are coarse grained, friable and highly weathered. Calcareous sand stones (Mio-Pliocene) occur unconformably over the Archaean basement and they are exposed in the North and Western region of Kamudi as broad elevated high ground. Major part of the study area is covered by alluvium brought by the rivers flowing from the West of this region. Marine and fluvio-marine sediments occur in Southern portion. Laterites are seen as patches within these marine sediments. Major part of the study area is covered by the flood plain. Pediments and buried pediments exist in northern highland areas.

2.7. HYDROGEOLOGY

2.7.1. WATER BEARING FORMATION:

The district is underlain by both porous and fissured formations. Unconsolidated & semi-consolidated formations and weathered, fissured and fractured crystalline rocks constitute the important aquifer systems in the district. The porous formations in the study area include sandstones and clays of recent to sub recent and tertiary age.

The alluvial formations comprising mainly sands, clays and gravels are confined to major drainage courses in the district. The maximum thickness of alluvium is 35.0 m. whereas the average thickness is about 25.0 m. Ground water occurs under phreatic to semi confined conditions in these formations and is being developed by means of dug wells and filter points. Alluvium, which forms a good aquifer system along the Vaippar and Gundar river bed, is one of the major sources of water supply to the villages.

The thickness of weathered zone in the study area is in the range of 4 to 15 m. The depth of dug wells ranges from 10 to 15 m below ground level. The yield of large diameter wells in the area, tapping the weathered mantle of crystalline rocks ranges from 40 to 110 litres per minute (lpm) and are able to sustain pumping for 2 to 6 hours per day. The yield of bore wells drilled down to a depth of 40 to 70 m, by various state agencies mainly for domestic purposes ranges from 10 to 350 lpm.

2.7.2. WATER LEVELS

The depth to water level in the district varied between 9.6 and 7.4 m bgl during pre-monsoon and varied between 9.4 and 5.6 m bgl during post monsoon. The seasonal fluctuation shows a rise in water level which ranges from 7m to 18m. The piezometric head varied between 3.49 and 5.9 m bgl during pre monsoon and 8.29 and 11.06 m bgl during post monsoon.

2.7.3. OCCURRENCE, MOVEMENT AND DISTRIBUTION OF GROUND WATER:

Ground water movement mainly takes place through the fractures and joints of the crystalline rocks and the ground water is transmitted through the voids and interstitial openings. Ground water movement in unconsolidated formations and alluviums is governed by the porosity depending on grain size, shape of grains, degree of sorting and degree of cementation. In other words, movement of ground water is controlled by the hydraulic conductivity of the aquifer and hydraulic gradient. A review of the topography and drainage pattern reveals that the general slope of the study area is towards east/southeast. Based on

the water level data, the overall ground water flow direction is towards east/southeast following the topography of the area.

3. GEOPHYSICAL INVESTIGATION METHODS

A variety of methods are available to assist in the assessment of geological sub-surface conditions. The main emphasis of the fieldwork undertaken was to determine the thickness and composition of the sub-surface formations and to identify water-bearing zones.

This information was principally obtained in the field using, and vertical electrical soundings (VES). The VES probes the resistivity layering below the site of measurement. This method is described below.

3.1. RESISTIVITY METHOD

Vertical electrical soundings (VES) were carried out to probe the condition of the sub-surface and to confirm the existence of deep groundwater. The VES investigates the resistivity layering below the site of measurement. This technique is described below.

3.2. VERTICAL ELECTRICAL SOUNDING (VES)

When carrying out a resistivity sounding, current is led into the ground by means of two electrodes. With two other electrodes, situated near the centre of the array, the potential field generated by the current is measured. From the observations of the current strength and the potential difference, and taking into account the electrode separations, the ground resistivity can be determined.

During a resistivity sounding, the separation between the electrodes is step-wise increased (in what is known as a Schlumberger Array), thus causing the flow of current to penetrate greater depths. When plotting the observed resistivity values against depth on double logarithmic paper, a resistivity graph is formed, which depicts the variation of resistivity with depth. This graph can be interpreted with the aid of a computer, and the actual resistivity layering of the subsoil is obtained. The depths and resistivity values provide the hydrogeologist with information on the geological layering and thus the occurrence of groundwater.

3.2.1. DEPTH OF INVESTIGATION

It is the maximum depth below the ground surface from where the geo-electric response can be measured at the surface. As explained above, the separation of current electrode pair decides the sub surface depth to which geo-electric response can be recorded. Under favorable condition, the depth of investigation varies 1/3rd to half of the current electrode

spacing. In the present study, the depth of interest was deeper (more than 50 m bgl), current electrode spacing was tried to be kept around 150 m so that response from depth of about 400 m can be recorded.

3.3. DATA ANALYSIS AND INTERPRETATION

The numbers of Schlumberger depth sounding measurements were carried out with maximum current electrode spacing in the study area as shown in ***Figure 4(a), 4(b),and 4(c).***

FIGURE 4 (A): VERTICAL ELECTRODE SOUNDING INSTRUMENT

FIGURE 5(B): ELECTRICAL RESISTIVITY SURVEY (SCHLUMBERGER METHOD) AT THE SDTPCPL

FIGURE 6(C)): ELECTRICAL RESISTIVITY SURVEY (SCHLUMBERGER METHOD) AT THE SDTPCPL

The field VES curves are converted to geo-electric parameters, which are true resistivity and used for defining the thickness of individual sub surface layers. The true resistivity value of the layer is ultimately converted to lithology of the layer including the expected ground water quality. This is based mainly on field experience, available electric and litholog from the existing wells in the survey area and knowledge on the limitations associated with electrical resistivity survey.

Field data analysis and interpretation have been done at 3 points around projected site at SDTPCPL area. Please see figure-5.

The data have been further analyzed to prepare 2D aquifer models using different software's. The various model prepared to reflect the change in lithology, configuration are shown in ***Figures 6 to 8.***

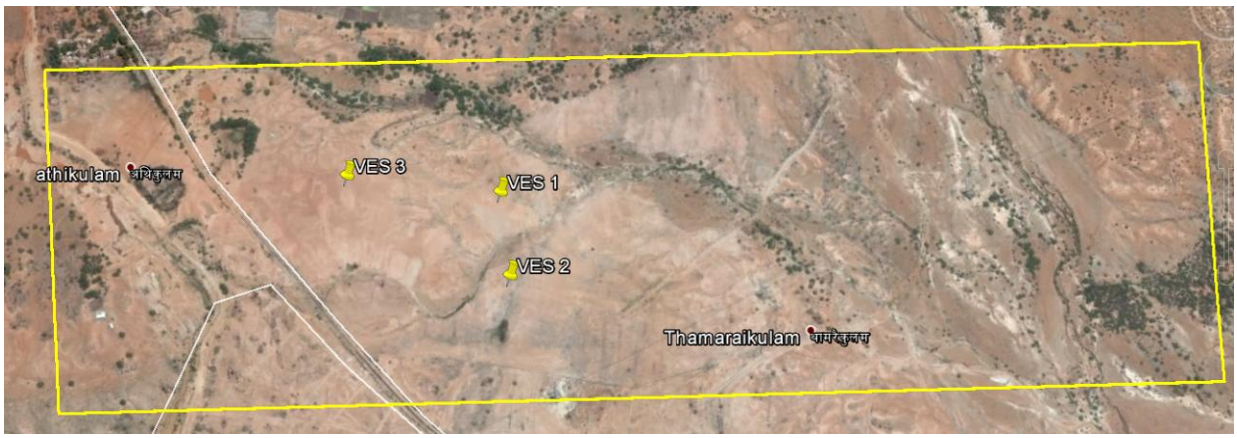

FIGURE 7: LOCATION MAP SHOWING THE GEOPHYSICAL SURVEY POINTS AT SDTPCPL

4. FIELDWORK AND RESULTS

4.1. GROUNDWATER LEVELS (DEPTH TO WATER LEVELS IN AT SDTPCPL AREA)

SDTPCPL has proposed to establish an Industrial Estate exclusively for Textile Processing, with an in-house Common Effluent Treatment Plant (CETP) and a Captive Power Plant (CPP) in the villages of Pottalkulam and Tamaraikulam. In this study, a well inventory network was established and seasonable water levels were monitored.

An attempt was also made to study the existing water level in the proposed area during the study period, in June 2017. Three bore wells were selected as observation points for monitoring water level changes and measured ground water level in these selected observation wells is given in ***Table 2.***

TABLE 2: GPS CO-ORDINATES AND BORE WELL WATER LEVEL LOCATION

Bore well No	Co-Ordinates		Ground water Levels (m)	Well Depth (in m)	Water is currently Drawn (in m)
	Latitudes	Longitudes			
7A	9°36'27.80"N	78°12'1.60"E	23	70	2.8
6A	9°36'34.38"N	78°11'53.30"E	24	68	2.5
Athikulam	9°36'44.67"N	78°11'42.16"E	39	84	3.7
Athikulam Near Mobile Tower	9°36'50.80"N	78°11'37.23"E	45	87	3.6

4.2 GEOPHYSICAL SURVEY

Fieldwork was carried on 11th June 2017. Three vertical electrical sounding (VES) was executed in order to unveil the hydro stratigraphy of the area. The hydrogeological conditions of the investigated site in general are considered to be fairly uniform and the results of the VES are representative of the prevailing stratigraphy of the investigated site.

TABLE 3: GPS CO-ORDINATES OF THE VES LOCATION

VES No	Co-Ordinates		Altitude (meter)
	Latitudes	Longitudes	
01	9°36'32.40"N	78°12'1.60"E	72
02	9°36'27.80"N	78°12'1.60"E	72
03	9°36'34.38"N	78°11'53.30"E	71

4.2. RESULTS

Interpreted results of the soundings are shown in the table 4 presented below:

TABLE 4: INTERPRETED RESULTS OF THE VERTICAL ELECTRICAL SOUNDINGS

Station Code	Layer	Resistivity (ohm-m)	Thickness	Depth in m	Geotechnical Implications
VES 1	1	6	2.4	3.4	Sandy Top Soil
	2	88	1.8	5.3	Gravel sand, silt and kankar with less clay sediments
	3	115	30.3	35.6	Clay mixed with sediment
	4	215	11.3	46.9	Clay mixed with sediment
	5	107	15	61.8	Sand coarse with less clay
	6	69		Inderminate	Sand coarse with less clay
VES 2 (Near Bore well 7A)	1	4	0.3	1.3	Sandy Top Soil
	2	5	1.1	2.4	Gravel sand, silt and kankar with less clay sediments
	3	39	9.6	12	Sand and silt partially dry medium sediments
	4	275	23.2	35.2	Sand coarse with less clay
	5	101	13.7	48.9	Sand coarse with less clay
	6	115		Inderminate	Sand coarse with less clay
VES 3 (Near Bore well 6)	1	5	1.2	2.2	Sandy Top soil
	2	9	4.3	6.5	Gravel sand, silt and kankar with less clay sediments
	3	1004	35.2	41.7	Sand and silt partially dry medium sediments
	4	122	19	60.7	Sand coarse with less clay
	5	70		Inderminate	Sand coarse with less clay

The VES interpretation results indicate a shallow superficial layer to a depth of less than 12 m bgl. The resistivity of this layer ranges between 4 and 275 Ohm-m interpreted to be sandy soils and wet clays. This is underlain by a 101 to 275 Ohm-m resistivity layer to a depth of 60 m bgl, interpreted to be Sand coarse with less clay with sediment carrying ground water at VES 1, 2, and VES 3. Which are aquiferous and water strikes is expected in this below layer.

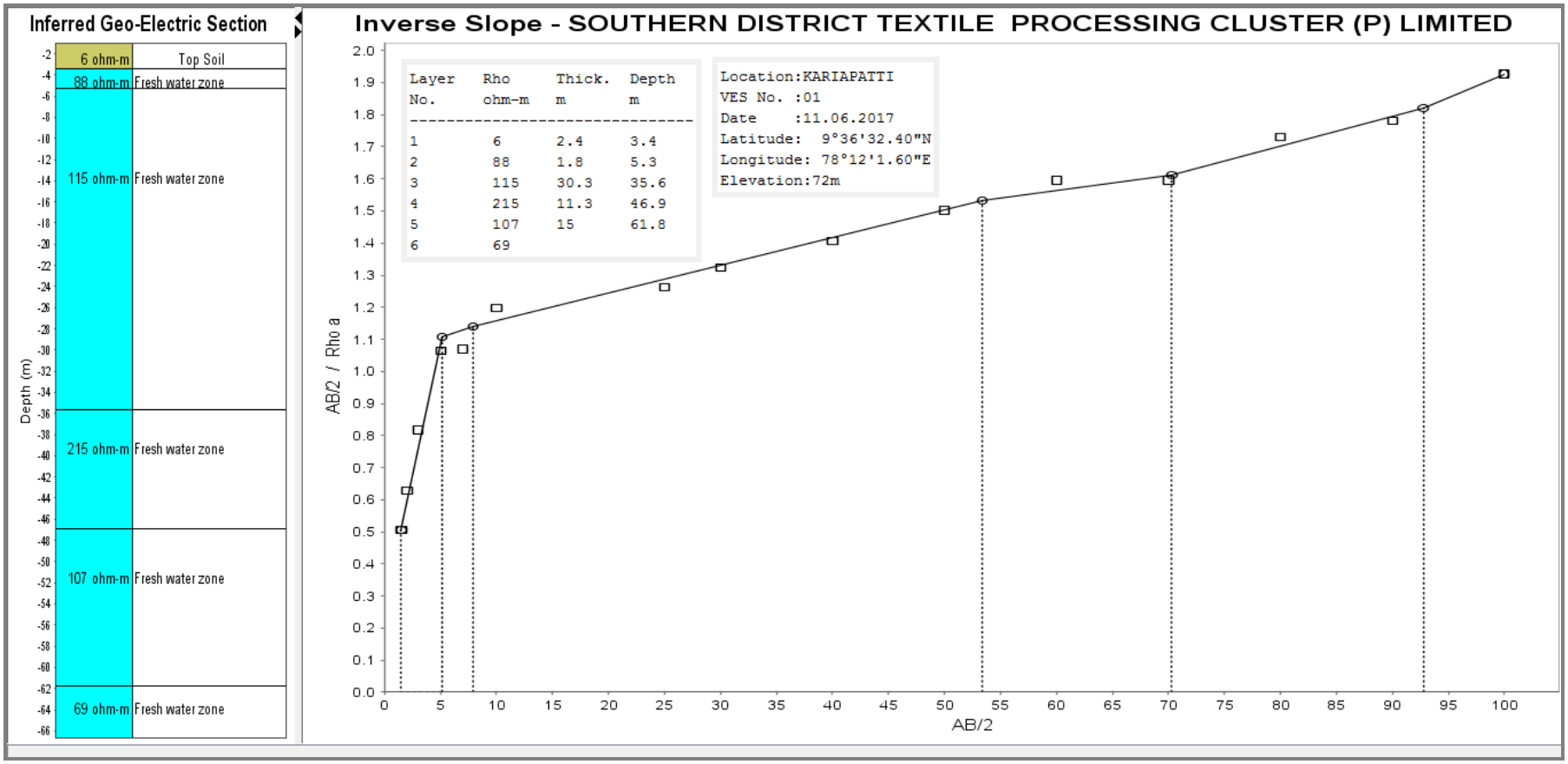

FIGURE 8: VES 1 INFERRED GEO-ELECTRIC LITHO SECTION AND SLOPE CURVE

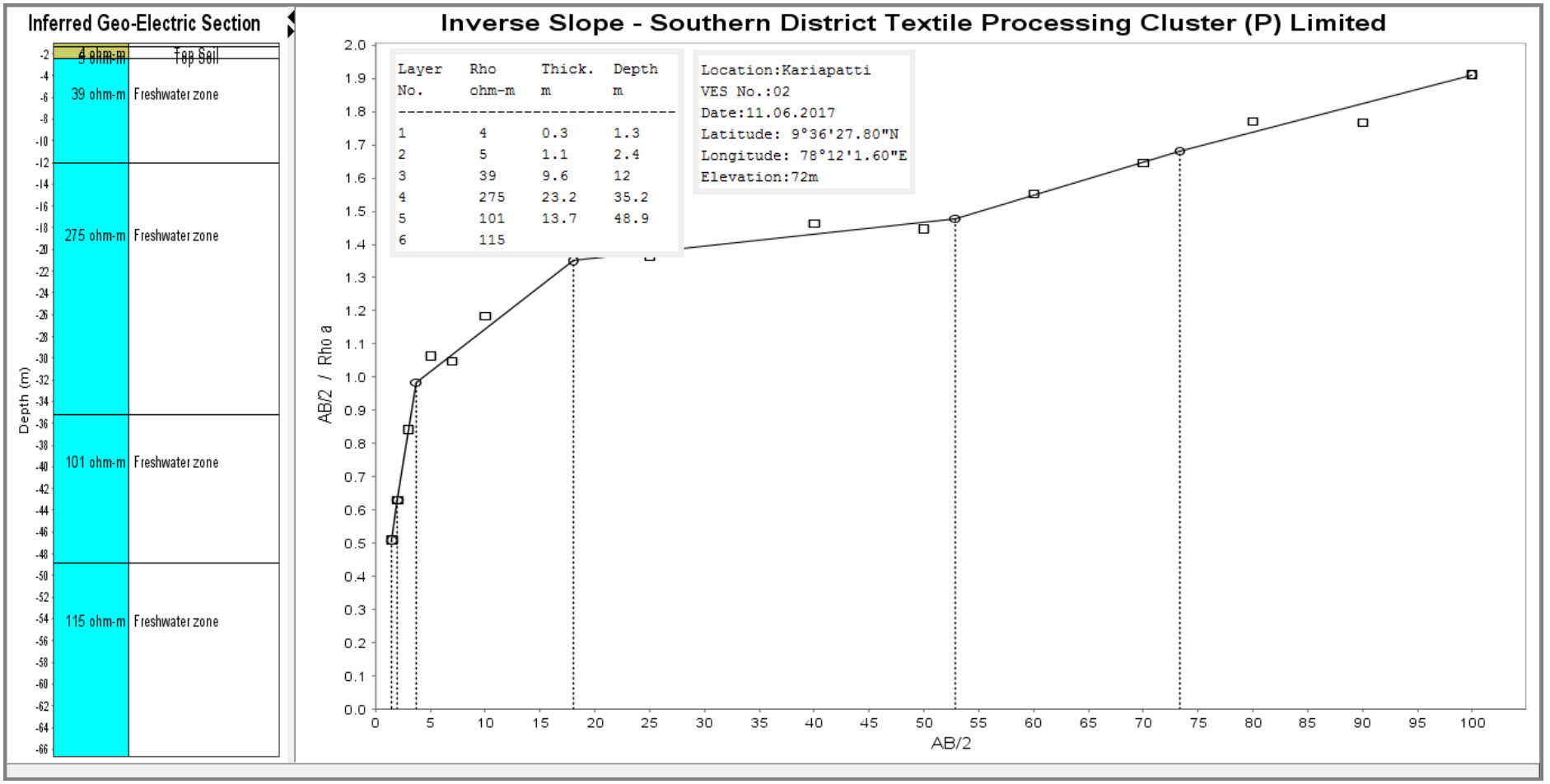

FIGURE 9: VES 2 INFERRED GEO-ELECTRIC LITHO SECTION AND SLOPE CURVE

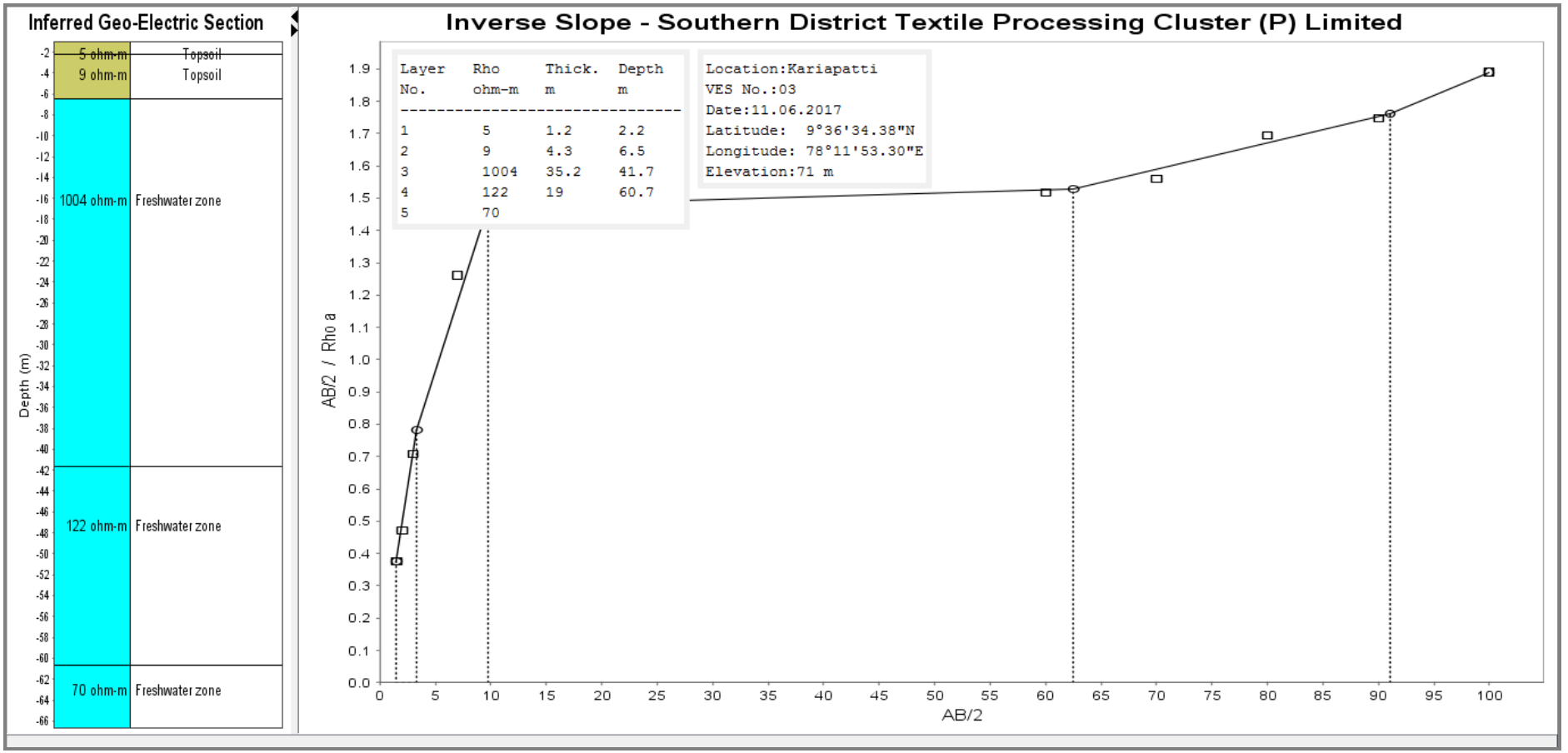

FIGURE 10: VES 3 INFERRED GEO-ELECTRIC LITHO SECTION AND SLOPE CURVE

5. CONCLUSION AND RECOMMENDATIONS

5.1. CONCLUSION

The hydrogeological studies conducted in this study area covering interpretation of geophysical data and Water level measurement at various survey locations can help in to understand the actual groundwater conditions in the study area and the availability of required source of water for the proposed project. Therefore, integration of these above data can give the groundwater potential of the area.

Aquifer Condition: - The alluvial formations comprising mainly sands, clays and gravels are confined to major drainage courses in the area. The maximum thickness of alluvium is 35.0 m. whereas the average thickness is about 25.0 m. Ground water occurs under phreatic to semi-confined conditions in these formations and is being developed by means of bore wells and filter points. Alluvium, which forms a good aquifer system.

The Aquifers are fairly thick & regionally extensive with large yield prospect of about bore wells drilled down to a depth of 60 to 70 m, by various place agencies mainly for domestic purposes ranged from 10 to 358 lpm.

5.2. RECOMMENDATIONS

Proposed bore well sites have been selected based on their exposure to recharge conditions as per the field investigation as detailed in the earlier section of the report. Also considering the qualitative data on likeliness to groundwater occurrence, related quality coupled by thickness of disturbed column to hard rock-a factor envisaging groundwater recharge and storage.

Referring to the above prospect of groundwater and its near non competing users, the proposed project may be not utilize the groundwater with the implementation of rainwater harvesting structure and adopting zero water discharge practices to prevail return recharge for their continuous yield thought out the year.

Annexure – IV

Coal and Fly Ash Handling Safeguards

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ANNEXURE – IV
COAL AND FLYASH HANDLING SAFEGUARDS

1.0 Safeguards in Coal Handling Plant

a) Transportation Safeguards

- Overloading of vehicles will be avoided.
- Only closed trucks will be used for transportation of coal.

b) Storage and Handling Safeguards

- Coal will be stored in an area of 0.5 ha, in such a way that coal heap is not higher than 5 m and clear distance between two adjoining heaps at ground level is 5 m, so that approach distance is made available in case of fires.
- Loading and Unloading operations will be carried out mechanically.

c) Pollution Control Measures

- The coal handling and storage area will be provided with an encircling compound wall with a height of minimum 9 m.
- The storage area will be provided with water sprinkling arrangements to minimize the dust that may arise during loading and unloading operations.
- Continuous water sprinkling will be carried out on the top of the coal stock piles at regular intervals to prevent dust generation, fire and smoke.
- Regular sweeping of coal dust from internal and main roads will be carried out to ensure adequate space for free movement of vehicles.
- The following air pollution control measures will be adopted:
    - Wind breaking wall to prevent the suspension of particles from heaps
    - Construction of metal road and RCC pucca flooring in the coal storage area
    - A system for regular cleaning and wetting of the floor area within the premises
- Proper drainage system will be provided in the coal storage area such that the water drained from sprinkling and runoff is collected at a common tank and will be reused after proper treatment.
- The Coal storage area will be surrounded by three rows of plantation consisting of tall growing trees all along the periphery of the coal handling premises, and along the roads.

d) Safety Requirement

- Coal handling unit will be provided with adequate fire fighting measures to avoid fire hazards which will include water storage facility at the site.
- An onsite emergency plan will be prepared and implemented.

e) Safety mechanisms in Conveyer Systems

1. Pull chord switch: This protection is to be operated manually by the operator when he senses some severe disaster. This pull chord can be operated from any position along the length of the conveyor belt.

2. Belt sway switch: These are mounted on the conveyors and protect the belt from excessive running out and getting edge worn/damaged.

3. Zero speed switch: When the speed of the conveyor drops below predetermined speed, it operates and trips the system to save it from congestion at the transfer points. It is usually fixed nearer to the tail pulley.

If one of the belts trips for any reason, all earlier belts will trip automatically along with the Corresponding vibrating feeders provided at input points.

f) Environmental Monitoring

In addition to the above requirements, Ambient Air Quality Monitoring will be carried out for parameters such as SPM, RSPM, and SO_2 and NO_x and the results will be submitted to the Tamil Nadu Pollution Control Board every month.

2.0 Safeguards at Fly ash Handling System

- The fly ash handling system will be designed to collect fly ash in dry form in silos using pressure type pneumatic system.
- Fly ash will be collected in hoppers, duct hoppers, ESP hoppers and stack hopper.
- Fly ash removal system will operate on either time cycle mode or level mode.
- Fly ash will be conveyed to fly ash silo with the help of compressed air through transport piping.
- The conveying air will be vented by vent fan through the ESP mounted on top of the silos in order to limit the dust concentration in the vented air. The fly ash generated will be collected and stored in closed storage yard.
- The fly ash will be disposed to fly ash brick manufacturers.
- OSHA standards will also be followed during the maintenance of the handling system.

Annexure – V

Mitigation Measures – Construction and Operational Phase

ANNEXURE – V

MITIGATION MEASURES – CONSTRUCTION AND OPERATIONAL PHASE

Sr. No.	Anticipated Impacts	Mitigation Measures
Construction Phase		
1.	**Soil** The probable impacts will be the removal of top soil for the laying of foundations of structures and the excavations carried out for the leveling of site.	• As soon as construction is over, the surplus earth will be utilized to fill up the low lying areas, the rubbish will be cleared and all unbuilt surfaces will be reinstated; • The top soil from the excavated areas will be preserved in separate heap for re-use during the plantation; • There will be minimum/optimum concreting of the top surfaces so that sufficient scope for maximum groundwater recharge due to rainfall with appropriate rain water harvesting measures is possible.
2.	**Air Quality** During construction phase, suspended particulate matter will be the main pollutant, which will be generated during the site development activities such as leveling of land, cutting and filling activities, transportation of construction material to the project site from various places, operation of DG sets for drilling, rock breaking, crushing etc. Due to the increased vehicular movements, increase in NO_x and CO concentrations will be observed at the project site.	• The transport vehicles using petrol or diesel will be properly maintained to minimize smoke in the exhaust. Water sprinkling is suggested to address this issue. • Construction equipment will be maintained and serviced regularly such that the gaseous emissions from these equipment are maintained within the design specifications; and • Construction activities will be restricted to daytime as much as possible to minimize disturbance during the night time.
3.	**Water Quality** During construction phase, water will be required for construction of structures, sprinkling on roads for dust suppression, domestic uses of the construction workers. Impact on water quality during construction phase will be due to non-point discharges of sewage generated at the project site by the construction workforce.	• The construction site will be provided with adequate toilet facilities for workers to meet the proper standards of hygiene. • These facilities will be connected to a packaged STP and maintained to ensure minimum environmental impact. • Temporary sedimentation tanks and bunds will be constructed for the settlement of the suspended matter in the run-off during monsoons.
4.	**Solid Waste** The Solid Waste during the construction phase will be the excavated top soil and municipal solid waste generated from the temporary housing area for the construction workers.	• The top soil will be properly collected and stored. This will be used for greenbelt development and avenue plantation. • The municipal solid waste generated will be handed over to local civic bodies.

ANNEXURE – V

MITIGATION MEASURES – CONSTRUCTION AND OPERATIONAL PHASE

Operational Phase		
1.	**Soil** All the impacts related with soils are restricted to the construction phase only; hence there will not be any impact of the proposed project on soils of the project site during the operational phase.	• All precautions will be taken to ensure that no adverse impacts are observed on the soil, during the operational phase.
2.	**Air Quality** The fugitive emissions will be generated from raw material handling area. Raw Material handling process is one of the main sources of fugitive emissions. Drawing of Coal from Coal Storage yard and grinding in hoppers are the activities that generate dust. The sources of gaseous pollutants within the proposed project are from captive Power Plant, DG sets and vehicular movement within the premises. Suspended Particulate Matters are likely to be generated from the Waste Heat Recovery Boiler (WHRB) Unit of the captive power plant. The emissions of Sulphur dioxide (SO_2) and oxides of Nitrogen (NO_x) will be due to operation of DG sets, in case of the failure of the power grid.	Fugitive Emission Control Measures: • The dust generated will be captured by Dust Extraction (DE) System and taken to a bag filter to separate out the dusts. The clean air is finally vented through a stack. • Provision will be made for water sprinkling to reduce the dust generation during coal handling operation. • Further, all fugitive emissions are likely to be controlled to a great extent, through proper development and maintenance of green belt undertaken within the proposed project site. Fly ash Handling System: • The fly ash handling system will be designed to collect fly ash in dry form in silos using pressure type pneumatic system. • Fly ash will be collected in hoppers, duct hoppers, ESP hoppers and stack hopper. • Fly ash removal system will be operated on either time cycle mode or level mode. • Fly ash will be conveyed to fly ash silo with the help of compressed air through transport piping. • The conveying air will be vented by vent fan through the ESP mounted on top of the silos in order to limit the dust concentration in the vented air. The fly ash generated will be collected and stored in closed storage yard. • The fly ash will be disposed to fly ash brick manufacturers. Gaseous Emission Control Measures: • To control the gaseous emissions, appropriate air pollution control measure involving Electro Static Precipitator (ESP) will be provided at boiler outlet for extracting the dust pollutant from flue gas. • In order to disperse the emissions during operation of the DG sets, adequate stack

ANNEXURE – V

MITIGATION MEASURES – CONSTRUCTION AND OPERATIONAL PHASE

		height will be provided as per TNPCB/CPCB norms.
3.	**Water Quality** The impacts during operational phase on water quality will be the consumption of fresh water from the proposed bore wells and the waste water generated from both the member units and sanitation facilities.	• Wastage of water will be totally avoided. • In order to conserve water resources and rainwater in the proposed project, efforts will be made to recharge ground water resources by constructing appropriate rainwater harvesting structures within the premises. A total of 169 nos. of recharge pits have been proposed, for the recharge of ground water. • The run-off from the roof terrace will be separately piped to underground collection tanks, after duly filtering the same. This water is proposed to be used for textile process, fire fighting, green belt development etc., after necessary treatment. The total harvestable water from the paved area of quantity 2236.8 m^3 will be stored in underground storage tanks • Periodic water audits will be conducted to explore the possibilities for minimization of water consumption. • The effluent generated will be treated in the CETP and reused for textile process. Wastewater generated from the domestic activities will be about 50.0 KLD and treated in common sewage treatment plant and treated water will be utilized for toilet flushing (22.5 KLD) and greenbelt maintenance (27.5 KLD). • No wastewater shall be discharged outside the cluster premises and the proposed project will be operated on zero discharge condition.

ANNEXURE – V

MITIGATION MEASURES – CONSTRUCTION AND OPERATIONAL PHASE

4.	**Solid Waste** The solid waste generated during operational phase will be the sludge generated from STP, Fly ash, Spent oil, Oil Sludge, CETP Sludge, MEE Salt and Discarded Containers,	• The Sludge from the STP will be used as manure for greenbelt. • The CETP sludge will be collected and stored in the Solid Waste Storage Yard before disposing in TSDF, Gummidipoondi. A Sill proof arrangement will also be provided, as per CPCB guidelines. • The sludge generated from CETP will be 220 TPM which will be stored in an area of 0.50 ha. • Single Composite liner system made of High Density Poly Ethylene (HDPE) geo membrane is to be provided to prevent the seepage of the CETP sludge cake into the ground. The thickness of the geo membrane will be 1.5 mm or more. • The MEE salt will be collected and reused in textile process by the member units. • The fly ash generated will be collected and stored in closed storage yard and then given to Fly ash brick manufacturers. • The discarded containers, bags/liners will be disposed by selling to authorized recyclers. • Canteen and Organic waste generated will be given to local panchayat for disposal and non-biodegradable waste will be disposed through CPCB authorized recyclers.

Annexure – VI

Details on CSR Activities

ANNEXURE – VI
DETAILS ON CSR ACTIVITIES

Southern District Textile Processing Cluster (P) Limited - Kariyapatti - Virudhunagar District									
Corporate Social Responsibility – Activities Proposed									
Action Plan									
Sl. No.	**CSR Activity**	**Name of the Village Covered under CSR Activity**	**Distance/ Direction from Project Site (km)**	**Population (As per Census Data,2011)**	**Proposed Infrastructure**	**No. of Facility under each activity**	**Cost per Facility (Rs. In Lakhs)**	**Total Capital Cost Proposed (Rs. In Lakhs)**	**Recurring Cost per Annum (Rs. In Lakhs)**
1	3 numbers of Creche and Day Care Centre at	1. Thamaraikulam	1.0; WSW	331	**Area Allocated** 300 Sq.ft - Two Rooms with Rest Rooms and other amenities	3 Nos	10	30	3.0
		2. Allalaperi	7.5; NNW	1238					
		3. Isalimadai	1.0; NNW	219					
2	2 numbers of Women Welfare Club and Vocational Skill Training Centre at	1.Thulukkankulam	5.0; East	309	**Area Allocated** 500 Sq.ft - Two Halls with rest rooms and equipments	2 Nos	15	30	5.0
		2. Allalaperi	7.5; NNW	1238					
3	Afforestation Activities	Afforestation activities will be carried out as a part of CSR activities, in the study area or land identified for plantation in association with the Tamil Nadu State Forest Department (SFD). The land area for afforestation will be identified based on the availability of Non-Forest Land (NFL) and Degraded Forest Land (DFL) in consultation with the SFD. At least 1000 plants per hectare will be planted as per the guidelines of MOEF&CC.				--	--	100	5.0
4	Training Centre - ITI	A well equipped ITI Training Centre will be established within the proposed project site to mainly focus on providing skill based training to all the rural unemployed youth in the study area.			Establishing one well equipped ITI	--	70	70	10
5	10 numbers of Bus Shelters At	1. Allalaperi (2 no's)	7.5; NNW	1238	10 numbers of Bus shelters with seating facilities at 7 villages as	10 Nos	5.0	50	2.0
		2. Chettikulam(2 no's)	2.0; NW	467					
		3. Isalimadai	1.0; NNW	219					
		4. Thamaraikulam	1.0; WSW	331					
		5. Thulukkankulam	5.0; East	309					

ANNEXURE – VI
DETAILS ON CSR ACTIVITIES

Southern District Textile Processing Cluster (P) Limited - Kariyapatti - Virudhunagar District									
Corporate Social Responsibility – Activities Proposed									
Action Plan									
Sl. No.	**CSR Activity**	**Name of the Village Covered under CSR Activity**	**Distance/ Direction from Project Site (km)**	**Population (As per Census Data,2011)**	**Proposed Infrastructure**	**No. of Facility under each activity**	**Cost per Facility (Rs. In Lakhs)**	**Total Capital Cost Proposed (Rs. In Lakhs)**	**Recurring Cost per Annum (Rs. In Lakhs)**
		6. Karaikulam	1.7; SSE	293	listed. In Villages Allalaperi, Chettikulam and Panikkurippu where 2 numbers of bus shelters are proposed based on the population data.				
		7. Panikkurippu - (2 no's)	3.9; WSW	1055					
6	15 numbers of Safe Drinking Water Facilities at	1. Allalaperi - (3 no's)	7.5; NNW	1238	Community Water Systems providing RO Treated Water for the villages	15 Nos.	5.0	75	5.0
		2. Chettikulam -(2 no's)	2.0; NW	467					
		3. Isalimadai - (2 no's)	1.0; NNW	219					
		4. Thamaraikulam – (2 no's)	1.0; WSW	331					
		5. Thulukkankulam - (2 no's)	5.0; East	309					
		6. Karaikulam-(2 no's)	1.7; SSE	293					
		7. Panikkurippu -(2 no's)	3.9; WSW	1055					
7	15 numbers of First Aid cum Health & Hygiene Clinics	1. Allalaperi- (3 no's)	7.5; NNW	1238	Constructing First Aid Centers and Health clinics	15 Nos.	5.0	75	5.0
		2. Chettikulam -(2 no's)	2.0; NW	467					
		3. Isalimadai-(2 no's)	1.0; NNW	219					

ANNEXURE – VI
DETAILS ON CSR ACTIVITIES

Southern District Textile Processing Cluster (P) Limited - Kariyapatti - Virudhunagar District									
Corporate Social Responsibility – Activities Proposed									
Action Plan									
Sl. No.	**CSR Activity**	**Name of the Village Covered under CSR Activity**	**Distance/ Direction from Project Site (km)**	**Population (As per Census Data,2011)**	**Proposed Infrastructure**	**No. of Facility under each activity**	**Cost per Facility (Rs. In Lakhs)**	**Total Capital Cost Proposed (Rs. In Lakhs)**	**Recurring Cost per Annum (Rs. In Lakhs)**
	at	4. Thamaraikulam -(2 no's)	1.0; WSW	331					
		5. Thulukkankulam -(2 no's)	5.0; East	309					
		6. Karaikulam-(2 no's)	1.7; SSE	293					
		7. Panikkurippu -(2no's)	3.9; WSW	1055					
Total								**430**	**35**