EXECUTIVE SUMMARY

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT OF PROPOSED IRRIGATION PROJECT BY CONSTRUCTION OF BARRAGE WITH HEAD SLUICES

(As per EIA Notification, 2006 dated 14.09.2006 and its amendments)

SECTOR 1(C) - RIVER VALLEY/IRRIGATION PROJECTS
CATEGORY – B1

LOCATION OF BARRAGE

Across the River Coleroon at RD 74/3 Mile

Village – Adhanur and Kumaramangalam
District – Cuddalore and Mayiladuthurai
State – Tamil Nadu

PROPOSED CULTIVABLE COMMAND AREAS

Total Command Areas – 9159 Ha
Cuddalore District – 6601 Ha
Mayiladuthurai District – 2558 Ha

PROJECT PROPONENT

THE EXECUTIVE ENGINEER
Water Resource Department,
Special Project Division,
Kumbakonam – 612001.

EIA CONSULTANT

AADHI BOOMI MINING & ENVIRO TECH (P) LTD

(QCI/NABET Accredited EIA Organization)

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EXECUTIVE SUMMARY

1.0 INTRODUCTION

The Executive Engineer, Water Resource Department, Special Project Division, Kumbakonam – 612001 (Government of Tamil Nadu) has proposed to construct Barrage with 84 vents across the River Coleroon at RD 74/3 mile in Adhanur and Kumaramangalam Villages to irrigate the cultivable command area of 9159 Ha in Cuddalore and Mayiladuthurai Districts.

Initially, the Executive Engineer of WRD has applied under Category B2 for obtaining environmental clearance of proposed irrigation project vide online proposal no. SIA/TN/RIV/406095/2022 dated 18.11.2022.

During the 358th SEAC meeting held on 24.02.2023, the committee observed that the construction work of barrage has been started earlier before getting Environmental Clearance and declared that the proposed project comes under violation category as per EIA Notification, 2006.

Thereby the SEAC recommended SEIAA to issue sector specific standard Terms of Reference (TOR) under violation category with public hearing for conducting Environmental Impact Assessment study along with ecological damage assessment plan, preparation of remediation plan, preparation of natural and community resource augmentation plan.

During 604th SEIAA meeting held on 23.03.2023, the authority accept the recommendation of SEAC and issued TOR under violation category vide Lr.No.SEIAA-TN/F.No.9677/Violation/ToR-1400/2022 dated 23.03.2023.

1.1 SCOPE OF THE PROJECT

The scope of the proposed project is construction and operation of barrage across the River Coleroon between Adhanur and Kumarangalam Villages in Cuddaore and Mayiladuthurai District to irrigate 9159 Ha of proposed command areas after obtaining environmental clearance from SEAC/SEIAA, TN.

The proposed project requires Draft EIA report for conducting public hearing and Final EIA Report for obtaining EC from as per Lr.No.SEIAA-TN/F.No.9677/Violation/ToR-1400/2022 dated 23.03.2023.

1.2. PROJECT DESCRIPTION

Table 1.1 Project Details

Project Details	
Proponent	**The Executive Engineer,** Water Resource Department, Special Project Division, Kumbakonam – 612001 (Government of Tamil Nadu)
Site Location	Across the River Coleroon at RD 74/3 mile, 12km downstream of Lower Anicut between Adhanur and Kumaramangalam Villages in Cuddalore and Mayiladuthurai District.
Geographical Co-ordinates	Left bank - 11˚11'45"N and 79˚32'04"E Right bank - 11˚11'14"N and 79˚32'29"E
Toposheet No.	58M/12
Elevation of river bed level	+9.5m above MSL
Capacity of barrage	0.334 TMC
Length of the barrage	1064.40
Cultivable command areas	9159 Ha 6601 Ha in Cuddalore District – 53 Villages 2558 Ha in Mayiladuthurai District – 35 Villages
Discharge of water	Through North Rajan channel for Cuddalore District Through South Rajan Channel for Mayiladuthurai District
Desilting in Storage area	Total area of Desilting – 382.0 Ha Cuddalore District – 341.46.0 Ha out of 382.0 Ha
Method of Desilting	Mechanized method by using Hydraulic excavators and tippers combination
Period of Lease	1 year
River bed level	+9.500m above MSL
Sill level	+10.00m above MSL
Depth of Desilting	0.5m below sill level upto scour vent or river bed level
Geological resources	30,110,379 m^3 between Lower Anicut and Proposed barrage (820.77.70 Ha)
Mineable reserves	Cuddalore District – 85,75,310 m^3

Shoal height	Cuddalore District – 3.825m Thanjavur District – 6.590m
Project Cost	Rs. 465.43 Crores
EMP Cost (Capital)	Constructional phase – Rs.10,10,000 Operational phase – Rs.4,60,000
Environment Recurring Cost	Constructional phase – Rs.16,00,000 Operational phase – Rs.4,00,000
CER Cost	RS. 7.46 Crores
Accessibility	
Nearest Habitation	Adhanur – 100m – N Kumaramangalam – 240m - S
Nearest Roadway	NH 81- connecting Coimbatore to Chidambaram 6.2km - N SH 150-Connecting Kattrupattacheri to Vaitheshwaran kovil – 2.6km – S MDR – Arulmozhidevan village to Ramadevinallur – 1.6km - NW Village road – Eyyalur to Adhanur – 60m N River bank road adjacent to project site
Nearest Railway station	Mayiladuthurai Railway Station-14.0Km-SE
Nearest Airport	Trichy International Airport-100km-SW
Environmental Sensitiveness	
Interstate Boundary	TamilNadu - Andha Pradesh Interstate boundary 197km - NW
Coastal Zone	Bay of Bengal – 34km- E. Hence the area does not attract the C.R.Z. Notification, 1991.
Reserve Forest	There is no Reserve forest and Protected forest located within 10km radius of project site. Periyavalayam R.F – 13.6 km - NW Vethiyarvettu R.F – 14.0km – NW Karuppurkodai R.F(within river bed) – 13.7km – SW Koovathur R.F – 19.0km – NW Melur Devanur R.F - 21.3km – NW Sooriyamanal R.F – 22km – NW Siluvaicheri R.F – 24.5km – NW Within Command areas:

<table>
<tr><td></td><td>Pichavaram R.F Extension</td></tr>
<tr><td>Wildlife sanctuary</td><td>Nil within 25km radius. The Proposed project site does not attract the Wildlife (Protection) Act, 1972.
Karaivetti Bird Sanctuary – 57 km-SW</td></tr>
<tr><td>Water bodies</td><td>The site itself is a Water body (Coleroon River).
1. Veeranam Lake-6.3 km-N</td></tr>
<tr><td>Habitations</td><td>
<table>
<tr><th>Name of Village</th><th>Direction</th><th>Distance from project site (Approx.)</th><th>Population</th></tr>
<tr><td>Adhanur</td><td>N</td><td>0.11</td><td>927</td></tr>
<tr><td>Kizhpuliyampattu</td><td>W</td><td>1</td><td>773</td></tr>
<tr><td>Tiruchitrambalam</td><td>S</td><td>1.5</td><td>6371</td></tr>
<tr><td>Sarabojiraja puram</td><td>SW</td><td>0.38</td><td>4782</td></tr>
</table>
</td></tr>
<tr><td>Defense Installations</td><td>Nil within 10km radius</td></tr>
<tr><td>Critically Polluted area</td><td>Nil within 10km radius</td></tr>
<tr><td colspan="2">Resources Requirement</td></tr>
<tr><td>Water Requirement</td><td>Construction phase of barrage – 12 KLD
Desilting in Cuddalore District – 8 KLD</td></tr>
<tr><td>Man Power</td><td>Construction phase of barrage – 300 people
Operational phase of barrage – 30 people
Desilting in Cuddalore District – 44 people</td></tr>
</table>

1.3. Details of barrage and other structures proposed to be constructed:

a) Barrage

The barrage has been designed for a design discharge of 4, 55,726 cusecs. The barrage is designed with raft foundation. The Barrage consists of

- Surplus Regulator
- Scour Vent.
- Upstream Protection works
- Downstream Protection works
- Barrage Shutters
- Operating Platform

b) Two lane bridges over the barrage

A two lane bridge has been proposed to be constructed along with the barrage for the purpose of inspection and to connect the villages on both banks of river the Coleroon. The width of the bridge including carriage way and both sides foot path is 12m and the total length of the bridge is 1064.40m with 84 Nos. of span.

c) Head sluice for North Rajan Channel

A quantity of 745 Cusecs of water has been proposed to be discharged from this barrage into North Rajan channel towards the stabilization of the existing ayacuts. For this purpose a head sluice has been proposed at the left flank of the barrage in the left bank of Coleroon.

Fig No 1.1 Head sluice of north rajan channel

d) Head sluice for South Rajan Channel

A quantity of 640 Cusecs of water has been proposed to be discharged from this barrage into South Rajan channel towards the stabilization of the existing ayacuts. For this purpose a head sluice has been proposed at the right flank of the barrage in the right bank of Coleroon.

Fig No 1.2 Head sluice of south rajan channel

e) Formation of Channel for Narimudukku Drain

The Narimudukku drain is diverted from upstream of proposed barrage to the downstream through existing south rajan channel by constructing baffle wall at the center of channel.

Fig No 1.3 Diversion of Narimudukku Drain into existing south rajan channel by constructing baffle wall at the centre of channel

f) Two Lane Bridge over North Rajan Channel

A two lane bridge has been proposed to be constructed across the North Rajan Channel to connect the villages in left bank of River the Coleroon. The overall width of the road is 15.775m and the width of the carriageway is 12.00m.

g) Two Lane Bridge over South Rajan and Narimudukku Drain

A two lane bridge is proposed to be constructed across Narimudukku drain and South Rajan Canal at the diversion location of Narimudukku Drain to connect the villages in right banks of River the Coleroon.

h) Syphon Aqueduct

A Syphon aqueduct is proposed to construct across the South Rajan Channel for a designed discharge of about 2500 Cusecs. The Syphon Aqueduct is designed for 4 Nos of vent having size of 3.05 x 2.40m.

i) Reconstruction of Kondappan Cauvery infall Regulator

It is proposed to construct a new Regulator at the point where the Kondappan Cauvery Regulator exists to drain a total discharge of about 3500 cusecs from Narimudukku Drain and Kondappan Cauvery Drain into Coleroon River. The Regulator design consists of 9 vent way of size of 2.70m x 2.00m.

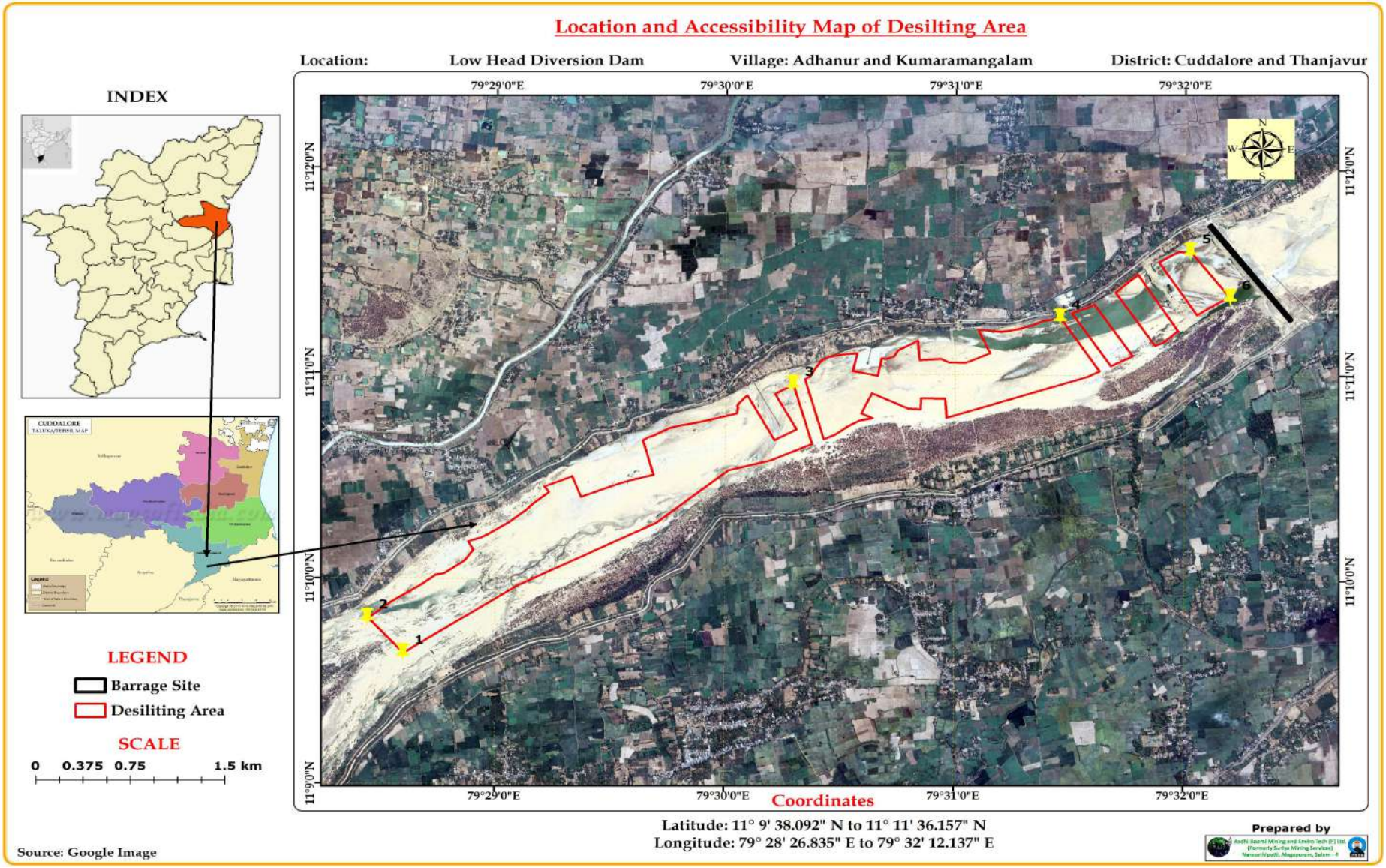

Fig No.1.4 Location of proposed barrage site

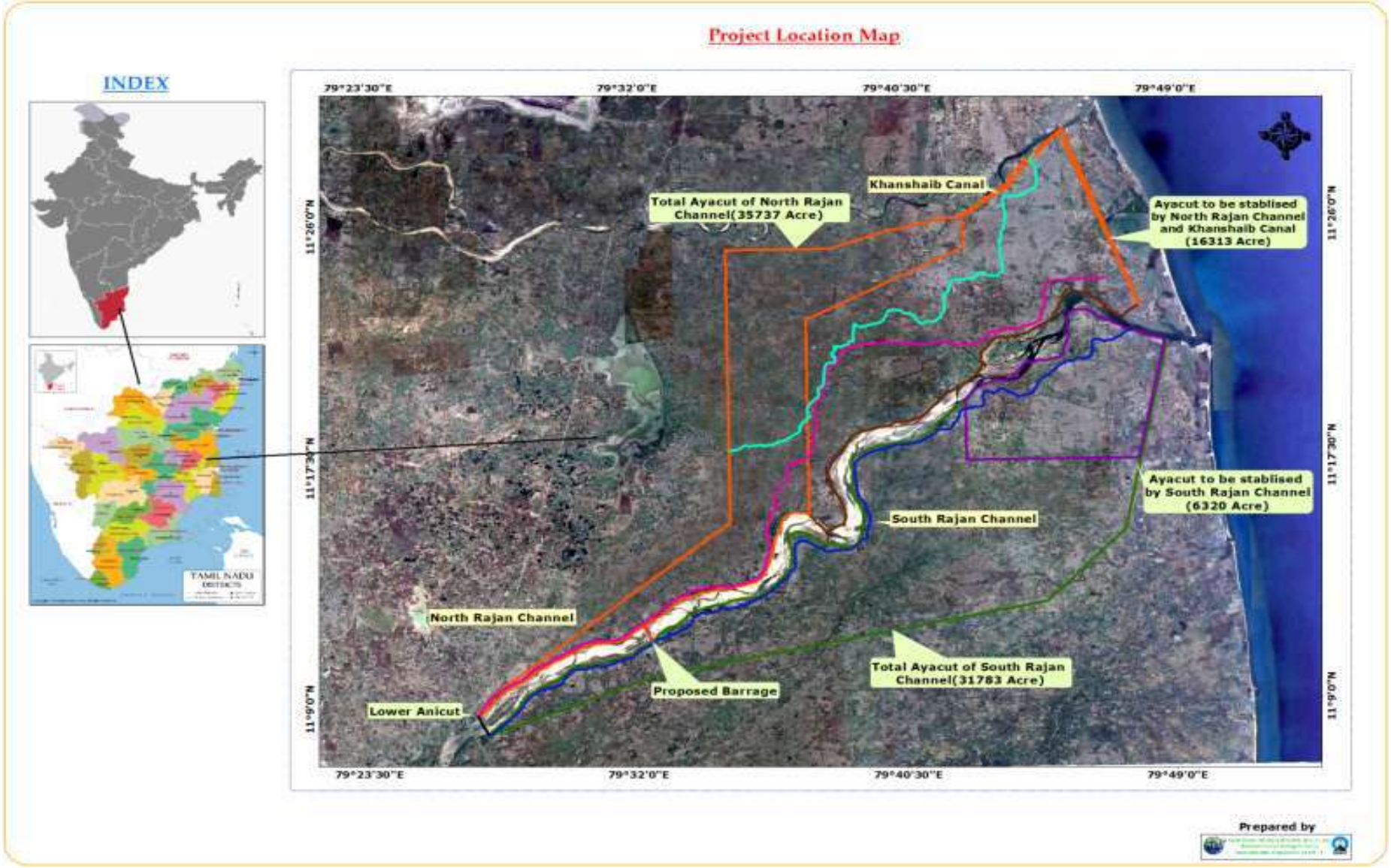

Fig No.1.5 Location of proposed command areas

1.4 Description of the environment

1.4.1 Base line environmental study

Collection of base line data is an integral part of the preparation of environmental impact assessment reports. The baseline monitoring study has been carried out during June 1st 2022 - May 31st, 2023 i.e, Monsoon – June 1st, 2022 to September 30th 2022, Post Monsoon – October 1st, 2022 to February 28th, 2023 and Pre Monsoon – March 1st, 2023 to May 31st, 2023to assess the existing environmental scenario in the area. For the purpose of EIA studies, Project site was considered as the core zone and area outside the site lease boundary up to 10km radius from the project site and in command areas was considered as buffer zone.

Table 1.2 Baseline Data

Particulars	Details		Standards
Meteorology (June 1st, 2022 – May 31st, 2023)			
Rainfall (Avg.)	Monsoon Period	317.3mm	--
	Post Monsoon Period	793.6mm	
	Pre Monsoon Period	818.6mm	
Temperature	Monsoon Period	25°C - 37°C	--
	Post Monsoon Period	21°C - 33°C	
	Pre Monsoon Period	23°C - 38°C	
Wind speed	0.6 to 1.1 m/s for 3 seasons		--
Wind Direction	From N, NE		--
Ambient Air Quality (NAAQS)			
PM_{10}	Monsoon Period	42.6 - 70.5 µg/m^3	100 µg/m^3
	Post Monsoon Period	40.4 - 67.3 µg/m^3	
	Pre Monsoon Period	44.2 - 72.5 µg/m^3	
$PM_{2.5}$	Monsoon Period	17.6 - 35.2 µg/m^3	60 µg/m^3
	Post Monsoon Period	16.5 - 32.6 µg/m^3	
	Pre Monsoon Period	19.8 - 37.1 µg/m^3	
SO_2	Monsoon Period	4.2 - 15.2 µg/m^3	80 µg/m^3
	Post Monsoon Period	4.1 - 14.1 µg/m^3	
	Pre Monsoon Period	6.4 - 17.1 µg/m^3	
NO_x	Monsoon Period	6.3 - 22.8 µg/m^3	80 µg/m^3
	Post Monsoon Period	5.9 - 19.8 µg/m^3	
	Pre Monsoon Period	8.1 - 24.7 µg/m^3	

Noise Level (CPCB Standard)			
Day time (6:00 am-10:00 pm)	Monsoon Period		**Industrial Area** Day Time - 75 dB (A) **Residential Area** Day Time – 55 dB (A)
	Core zone	41.8 - 43.5 dB (A)	
	Buffer zone	37.4 - 48.1 dB (A)	
	Post Monsoon Period		
	Core zone	40.6 - 41.7 dB (A)	
	Buffer zone	39.5 - 46.2 dB (A)	
	Pre Monsoon Period		
	Core zone	42.7 - 45.3 dB (A)	
	Buffer zone	39.6 - 50.1 dB (A)	
Night time (10:00 pm-6:00 am)	Monsoon Period		**Industrial Area** Night Time – 70 dB(A) **Residential Area** Night Time – 45 dB (A)
	Core zone	38.2 - 41.3 dB (A)	
	Buffer zone	36.1- 42.6 dB (A)	
	Post Monsoon Period		
	Core zone	37.3 - 40.5 dB (A)	
	Buffer zone	38.4 - 42.9 dB (A)	
	Pre Monsoon Period		
	Core zone	40.4 - 42.6 dB (A)	
	Buffer zone	35.4 - 43.7 dB (A)	
Water Quality IS 10500:2012 (Desirable limits)			
Ground Water			
pH	Monsoon Period	6.90 - 8.31	6.5 to 8.5
	Post Monsoon Period	6.55 - 8.12	
	Pre Monsoon Period	7.06 - 8.50	
TDS	Monsoon Period	250 - 3006 mg/l	500 mg/l
	Post Monsoon Period	236 - 2950 mg/l	
	Pre Monsoon Period	301 - 3158 mg/l	
Electrical conductivity at 25˚C (Micromhos/cm)	Monsoon Period	403 - 5094	-
	Post Monsoon Period	395 - 4522	
	Pre Monsoon Period	415 - 5124	
Total Hardness as $CaCO_3$	Monsoon Period	57 - 857 mg/l	200 mg/l
	Post Monsoon Period	45 - 864 mg/l	
	Pre Monsoon Period	82 - 864 mg/l	
Total suspended solids	Monsoon Period	1 -18 mg/l	-
	Post Monsoon Period	1 - 12 mg/l	
	Pre Monsoon Period	1 - 14 mg/l	
Chlorides Cl	Monsoon Period	19 - 973 mg/l	250 mg/l

	Post Monsoon Period	26 - 1052 mg/l	
	Pre Monsoon Period	10 - 912 mg/l	
Total iron Fe	Monsoon Period	0.03 - 3 mg/l	0.3 mg/l
	Post Monsoon Period	0.03 - 3 mg/l	
	Pre Monsoon Period	0.03 - 3 mg/l	
Sulfates SO_4	Monsoon Period	4 - 67 mg/l	200 mg/l
	Post Monsoon Period	8 - 62 mg/l	
	Pre Monsoon Period	8 - 75 mg/l	
Surface Water			
pH	Monsoon Period	7.14 - 8.13	6.5 to 8.5
	Post Monsoon Period	7.25 - 8.33	
	Pre Monsoon Period	7.20 - 8.19	
TDS	Monsoon Period	296 - 796 mg/l	500 mg/l
	Post Monsoon Period	328 - 462 mg/l	
	Pre Monsoon Period	315 - 495 mg/l	
Electrical conductivity at 25˚C	Monsoon Period	496 - 1342	-
	Post Monsoon Period	498 - 732	
	Pre Monsoon Period	554 - 823	
Total Hardness as $CaCO_3$	Monsoon Period	95 - 249 mg/l	200 mg/l
	Post Monsoon Period	108 - 254 mg/l	
	Pre Monsoon Period	105 - 495 mg/l	
Total suspended solids	Monsoon Period	1 - 2 mg/l	-
	Post Monsoon Period	1 - 2 mg/l	
	Pre Monsoon Period	1 - 2 mg/l	
Chlorides Cl	Monsoon Period	67 - 210 mg/l	250 mg/l
	Post Monsoon Period	72 - 223 mg/l	
	Pre Monsoon Period	59 - 208 mg/l	
Total iron Fe	Monsoon Period	0 - 0.08 mg/l	0.3 mg/l
	Post Monsoon Period	0 - 0.08 mg/l	
	Pre Monsoon Period	0 - 0.08 mg/l	
Sulfates SO_4	Monsoon Period	4 - 26 mg/l	200 mg/l
	Post Monsoon Period	8 - 28 mg/l	
	Pre Monsoon Period	5 - 29 mg/l	
Soil Quality			
pH	Monsoon Period	6.33 - 8.49	Neutral in nature
	Post Monsoon Period	6.50 - 8.72	
	Pre Monsoon Period	7.03 - 9.07	

Bulk density	Monsoon Period	1.0 - 1.62 g/cc	Favorable physical condition for plant growth.
	Post Monsoon Period	1.0 - 1.58 g/cc	
	Pre Monsoon Period	1.0 - 1.45 g/cc	
Hydro Geology			
Water Table	Monsoon Period	1 - 13.7m bgl	
	Post Monsoon Period	1.5 – 14.0m bgl	
	Pre Monsoon Period	2 – 15m bgl	

1.5 Anticipated Environmental Impacts and Its Mitigation Measures

1.5.1 Air Environment

a) Impacts during Construction Phase

- The transportation of raw materials to project site through the earthen and gravel road, unloading of construction materials, excavation of earth and loading of earth into tippers, stacking of cements and aggregates will generate fugitive dust and affects the habitations located in the predominant wind directions.
- Workers with long term exposure to fine particulate dust are at risk of pneumoconiosis, emphysema, bronchitis, silicosis and fibrosis.
- The generated dust gets deposited in the water body and it affects aquatic organisms which will disturb the ecosystem.
- The usage of DG sets in the site and continuous operation of diesel operated vehicles may increase global warming

Mitigation Measures

- Covering of truck carrying raw material to the project site to control the dust emission from truck. Sprinkling of water in the gravel and earthen road during the movement of trucks for the suppression of dust.
- Covering of raw materials stored in the project site with tarpaulin to prevent dust emission due to wind movement in the site specific. Covering of the project site using dust control curtains at the boundary of project site to prevent the escape of dust to the adjacent agricultural lands and villages.
- Regular maintenance of tippers and other equipments for the controlled gaseous emission of CO, SO_x and NO_x. Provision of PPE such as mask and ear plugs to the labors worked to dust prone zone.

- The Retrofit Emission Control Device will be fitted with all DG set to control the emission of particulate matter and carbon. The ambient air quality will be monitored three months once to adopt the environmental management plan effectively to comply the air quality with NAAQS.

b) Impacts during Operational phase

- The storage of water in the barrage and the discharge of water in the open atmosphere will cause evaporation of water. When more water evaporates in an area, the humidity in the particular area will be high. Humidity holds particles in the air close to the ground, increasing and sustaining the levels of air pollution in the atmosphere.
- High humidity can have an adverse effect on the human body.

Mitigation Measures

- It is suggested to use the stack in sufficient height for all the industries and DG sets in houses to exhaust the flue gases to the outside air.
- If there is any mud road or non paved road, the road should be properly compacted with bull dozers to control the emission from road during any transportation.
- To overcome the effects of humidity, any people who are working continuously should take break and hydrate often. Moreover finding air conditioners or ceiling or table fan during break is better to reduce the stress level due to humidity.

1.5.2 Noise Environment

a) Impacts during Construction Phase

Noise pollution poses a major health risk to the workers. The sources of noise in the proposed barrage is operation of excavators, cranes, movement of tippers and other construction works such fitting of scaffolding and shutters etc.

The noise generated by the construction activity will be dissipated within the core zone. This is because of distance involved and other topographical features adding to the noise attenuation. From the results, it can be seen that the ambient noise levels (day time and night time) at all the locations are within permissible limits prescribed by CPCB. At present there is no construction activity carried out. However, the expected noise levels are not likely to have any effect. Precaution will be made to keep down the noise exposure level of 85 dB (A) to the operating personnel for 8 hrs duration.

Mitigation Measures

- Use of personal protective devices i.e., earmuffs and earplugs by workers, who are working in high noise generating areas.
- Limiting time exposure of workers to excessive noise.
- Proper and regular maintenance of vehicles, machinery and other equipments.
- The noise generated by the machinery will be reduced by proper lubrication of the machinery and other equipments.
- Speed of trucks entering or leaving the site will be limited to moderate speed to prevent undue noise from empty vehicles.
- Providing proper noise proof enclosure for the workers separated from the noise source and noise prone equipment
- Provision of Quiet areas, where employees can get relief from workplace noise.
- Regular medical check–up and proper training to personnel to create awareness about adverse noise level effects.

b) Impacts during Operational phase

During operation phase, the storage of water will not generate major noise level. The discharge of water between sill level and shutters generate noise. It may affect the staffs working in the barrage and normal life of people in the nearest habitations.

Mitigation Measures

During operational phase, the noise generated during discharge of water between sill level and shutters will be controlled by greenbelt development on both sides of river banks.

1.5.3 Water Environment

a) Impacts on Ground water during construction phase

The stacking of raw materials such as cement and other building materials such as paints, resins, retarders, hardeners, mould releasing agents etc on the open land affects the soil quality and it indirectly affects the ground water quality when the surface water infiltrates into the ground along with surface materials. The spillages of materials in the construction place will affect both surface and ground water and soil qualities.

Mitigation Measures

All the raw materials should be stacked over the impervious layer and it should be covered with rain proof materials along the bank of river. During construction activities, only the required materials have to be shifted to working place (river bed) and it should be placed over impervious layer to protect the ground water quality. Tarpaulin has to be placed over the river bed and other ground surface to carry the spillages.

b) Impacts on Ground water during operational phase

The storage of water in the barrage and discharge of water through north rajan and south rajan channel increase the ground water table in the villages around the storage area and in the command areas. The ground water recharge due to seepage from the channel increase the quality of ground water by diluting the concentration of Total dissolved solids. **(Positive impact)**

c) Impacts on Surface water during constructional phase

The water required for construction of barrage and other structures has been withdrawn from bore well and no river water was used for any purposes during construction work. The flow of river water was diverted without affecting any aquatic organism during construction of each pier and each segment of raft foundation. Hence Coleroon River water resources and its quality has not been affected by this project.

The bridge over the north rajan and south rajan channel will be constructed during summer season when the flow of channel water is nil.

The diversion of Narimudukku drain into the south rajan channel will supports the agricultural activity between diversion point and Syphon Aqueduct along the channel. **(No Negative impact).**

d) Impacts on Surface water during operational phase

There are no surface water bodies such as lakes and ponds found within cultivable command area of Cuddalore and Mayiladuthurai Districts. Due to water storage in the proposed barrage, water saved in Lower Anicut could be taken into Veeranam tank through the Vadavar channel as a supplementation and there by this scheme becomes a BOON for New Veeranam scheme that has already been proposed for Chennai drinking water supply scheme.

Recommendations

The north rajan channel with the length of 55.1 km and south rajan channel with length of 54.1km has to be desilted every year before discharge the river water into each channel. Bushes which are obstacles to water flow and garbage which will cause water pollution has to be cleared periodically.

1.5.4 Soil Environment

a) Impacts during Construction Phase

The storage of construction materials directly on the soil surface will affect the soil quality in that particular area and during rainy season, the leachate from storage affect the soil quality in the surrounding areas. During foundation work, the excavated sand was dumped in the deepest bed level of Coleroon River and the excavated silt, gravel and clay were dumped along the river bank. It will be used for strengthening of river banks in upstream side of proposed barrage.

Mitigation Measure

- All the construction materials should be stored on impervious layer and it should be covered with rain proof materials.
- The dumping of sand over the deepest bed level should be properly levelled and the silt, gravel and clay properly stacked without affecting the flow of river water.
- Part of mineral rich soil has to be used for green belt development in the earmarked site.

b) Impacts during Operational Phase

Irrigation provides soil moisture for good plant growth throughout the growing season. The proposed project provides sufficient water for irrigation which leaches out salts present in soil. Irrigation of sufficient water plays an important role in the soil bacteria community which supports growth of crops. During operational phase, the proposed project has **positive impact on the soil environment.**

Recommendation

In the operation phase, the maintenance works involves white wash, painting of barrage, bridges, infall regulators, syphon aqueduct, baffle walls, lubrication of gearing shutters etc. During these works, the spillages will affect the quality of soil. So, it is suggested to use water proof tarpaulin on the soil surface during such works to protect the soil environment from spillages. The waste oil generated from DG sets and during

maintenance of other equipment should be stored in MS drums and collected by the authorized recyclers for recycling and reuse.

1.5.5 Biological Environment

a) Impacts during Construction Phase

There are no notified endangered species in the area, which may be affected due to the construction activities; therefore the biological environment will not have significant impact due to construction activity. The impact on the biological environment due to amount of dust generation is minimized by well-developed green belt in and around project site and covering of the project site using dust control curtains.

b) Impacts during Operational phase

During operation phase, the water stored in the barrage provides habitation for fishes and other aquatic organisms. Due to this project, the production of paddy crop shall be increased from 8529MT to 29624MT. The project proponent is proposed to plant 1000 No of tree saplings along River banks, Village roads and along the both channels

1.5.6 Land Environment

a) Impacts during Construction Phase

The proposed low head diversion dam(barrage) store the water of 0.334 TMC and divert the water through north rajan and south rajan channel for irrigating proposed CCA of 9159 Ha and the excess water will automatically drain into the Coleroon River by surplus over the sluice of barrage. The land use of river water body will remain river; only the part of water will be stored and diverted for irrigation purposes.

b) Impacts during Operational phase

In the cultivable command area, due to insufficient irrigation water, most of the lands are seen without agricultural activity. During the operational phase of barrage, those lands will be cultivated with paddy, pulses and with other regional crops. Hence land use of CCA will remain agricultural land but all the land gives greenery looks.

There will be no negative impact on land environment due to this project.

1.5.7 Socio Economic Environment

a) Impact during construction phase

The proposed barrage project provides job opportunities of 300 people in construction phase. Out of 300 people, 150 people from the surrounding village have been benefited.

Until the completion of this project, preference will be given to the local population for employment in all categories including semi-skilled and unskilled. For executing this project, both the patta and poramboke land in both the bank river has been acquired. The details are given below.

Table No 1.3 Land Acquisition Summaries

Sl. No	Description	Patta in Ha.	Poramboke in Ha.
1	Left Bank	41.435	48.825
2	Right Bank	61.64	1.115
Total		**103.075**	**49.94**

Mitigation Measures

The Government has accorded Administrative approval for the scheme and administrative sanction for land acquisition charges for Rs 31.3457 crore vide GO (Ms) No 48 dated 23.02.2018.

b) Impacts during Operational phase

During discharge of water through north and south rajan channels to proposed cultivable command area, the paddy and pulse cultivation will be increased dramatically. The fish culture activity and improved agricultural activity improves the economic and living standard of the people living along the barrage and in CCA. The increase in production of paddy and pulses may help to eradicate the poverty and starvation throughout the country. The impact of barrage is inundation of nearest agricultural land if the dam is broken unfortunately.

Mitigation Measures

- The barrage and head sluice of north and south rajan should be maintained yearly once. The rope of shutters, gear mechanism for lifting the shutter should be checked.
- The desilting of barrage below the level (+9.50m) should be avoided to maintain the stability of foundation.
- The WRD staffs should be engaged in the barrage all days to monitor the storage of water in the barrage and movement of vehicles over the bridge.
- Danger boards should be placed around the barrage to not to swim in the water body and not to take photographs near the parapet wall.

- During flood season, before discharge river water into the river and channels, the announcement has to be made to alert the public people.
- The sewage of village should not be discharged into the water body.
- The stability of Kumaramangalam Water intake located at 140m away from proposed barrage should be inspected periodically.

1.6 Occupational Health Measures

Table No 1.4 Plan and fund allocations towards occupational health & safety of the workers

Frequency of Health Examination	Total Workers	Fund allocated for Health Check up
Six months once	300	6.0 Lakhs

1.7 Justification for selecting the location

- The North Rajan and South Rajan Channel are located adjacent to the proposed barrage. So the channels will be easily connected to the proposed barrage to divert water for irrigation purposes.
- There is no transportation bridge located within the storage area of proposed barrage.
- Road facility is available on both left and right banks of proposed barrage. So the raw materials will be easily transported to project site for construction activity.
- Initially, the barrage was proposed to construct at RD mile 74/4 in which Kondappan Cauvery Drain is located upstream of the proposed barrage. The Kondappan Cauvery Drain bed level is (+8.505m) much lower than the crest level fixed for the proposed regulator (i.e., +10.000m). It was found that this will lead to cause stagnation of water to a depth of 1.495m in upstream side of the proposed regulator. So it was planned to construct proposed barrage at RD mile 74/3.
- Two major water supply intakes and more than five minor water supply intakes are located storage area of proposed barrage. So the water stored in the barrage will regularly supply water to existing villages.
- The stretch of the river is straight in this location.
- As the elevation of proposed sill level is less than the surrounding area, the storage of water in the barrage will not submerge the surrounding lands.

- The length of the river from the proposed barrage to sea shore is 45km and the proposed barrage is not last barrage in this river. The Government of Tamil Nadu has proposed to construct two more barrages in the downstream of proposed project. From analysis all the aspects, RD 74/3 is the suitable place to construct this proposed barrage.

1.8 Benefits of project

1.8.1 Construction phase

During construction phase more than 300 people are employed for executing barrage across Coleroon River at RD 74/3 mile. More than 150 people are employed from the nearby surrounding villages. The construction of barrage is long term project which provides employment for more than 4 years.

It provides employment for all categories of people such as skilled, semi skilled and unskilled. Due to this project, the income of people in the nearby villages is increased which are invested in buying tractors and other agricultural equipment. Even though the construction work is completed, they can make income through agricultural activities by using those modern agricultural equipments.

Depending on this construction activity and people working in the site, the village people has earned money by starting tea shop, mini hotels, petti shops, mechanic shed etc. Also many houses in the village are rented by officials of WRD and contractors. These are the indirect employment of this project.

1.8.2 Operational phase

The proposed low head diversion dam diverts the required water with high water pressure for stabilizing the ayacuts in Cuddalore and Mayiladuthurai District and after meeting the demands, the remaining water will be drained into the Coleroon River. Due to water storage in the proposed barrage, water saved in Lower Anicut could be taken into Veeranam tank through the Vadavar channel as a supplementation and there by this scheme becomes a BOON for New Veeranam scheme that has already been proposed for Chennai drinking water supply scheme.

Due to this scheme, the water level in the adjoining wells and tube wells in the percolation area adjacent to the proposed water spread area of the barrage and in the existing ayacut of North and South Rajan channel will be considerably increased due to ground water recharge.

Due to the proposed project, the area of paddy cultivation will be increased from 1730 Ha to 6009 Ha. Subsequently, tonnage of paddy production will be increased from 8529MT to 29624MT which is 3.5 times of present production quantity.

1.8.3 Benefits under CER Activity

Under Corporate Environmental Responsibility (CER) plan, the Executive Engineer, the project proponent of the proposed barrage will provide required facilities to the nearest villages by using 0.25 to 2% of the project cost.

1.9 Environmental Management Plan

The **Environment Management Plan (EMP)** is required to ensure sustainable development in the study area. Hence it needs to be a comprehensive plan for which the industry, Government, Regulating agencies likes Pollution Control Board working in the region and more importantly the population of the area need to extend their co-operation and contribution.

It has been evaluated that the project area will not be affected significantly due to industrial activity. Mitigation measures at the source level and an overall Management Plan at the site level are elicited so as to improve the surrounding environment.

1.9.1 Environment Management Cell

It is important to have a permanent organizational set up for implement of environmental management plan. Conscious of this, the Executive Engineer will create Environmental Management Cell to coordinate the activities concerned with the WRD and implementation of the environmental mitigation measures during construction and operation phases of the proposed barrage.

The Executive Engineer will be responsible for the implementation of mitigation measures during construction and operation phases of the proposed barrage. Environmental Management Cell (EMC) will be headed by Executive Engineer supported by adequate number of personnel and third party(Environment Consultant) having sufficient educational and professional qualification and experience to discharge responsibilities related to environmental management including statutory compliance, pollution prevention, environmental monitoring, preventive maintenance of pollution control equipment and green belt development as well as maintenance. Environment Management Cell (EMC) will look after the environment related matters during the operation phase of the barrage. Environment Management Cell (EMC) will also look into any infringement/ deviation/ violation of the environmental or forest norms/ conditions.

The organization set-up of the Environmental Management Cell (EMC) is presented in Figure 1.6.

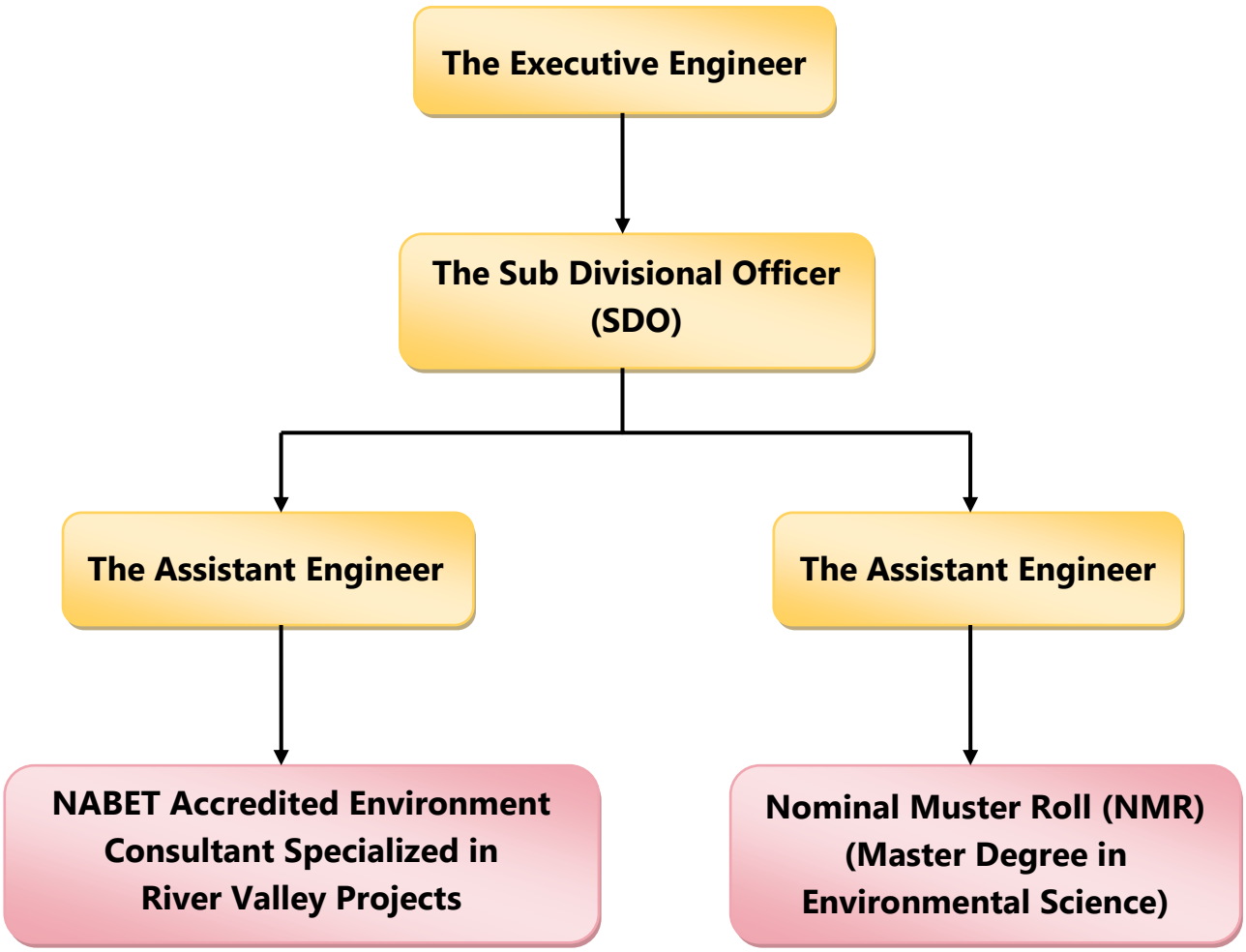

Fig No 1.6 Chart of Environment Management Cell

Table No 1.5 EMP Budget during Construction Phase

S. No	Description	Capital Cost in Rs.	Recurring Cost/year in Rs
1	Safety kits - Rs.1000/Labor	3,00,000	2,00,000
2	Environmental Monitoring	-	1,25,000
3	Water sprinkling on the exposed ground, unpaved road	Hiring tractor mounted with water tank	3,00,000
4	Disposal of Bio Sludge generated from Septic Tank	-	1,00,000
5	Management of Municipal Solid Waste (Biodegradable and Non Biodegradable)	-	1,00,000
6.	Display board with Environmental Conditions	1,00,000	20,000
7.	First aid facility in the site	1,00,000	1,00,000
8.	Health check up of workers	3,00,000	3,00,000
9.	Greenbelt development along the banks – 500 tree saplings	1,00,000	25,000
10	Installation of safety sign boards	1,00,000	20,000
11	Monitoring of safety through Safety Engineer	-	3,00,000
12	Fire extinguisher, sand buckets	10,000	10,000
Total		**Rs. 10,10,000/-**	**Rs.16,00,000**

Table No 1.6 EMP Budget during Operational Phase

S. No	Description	Capital Cost in Rs.	Recurring Cost/year in Rs
1	Environmental Monitoring	-	2,50,000
2	Display board with Environmental Conditions	1,00,000	20,000
3	First aid facility at the barrage	50,000	50,000
4	Greenbelt development along the banks, Channels and village roads– 1000 tree saplings	2,00,000	50,000
5	Installation of danger board mentioning not to swim in water storage area and not to take selfie near parapet wall, storage area.	1,00,000	20,000
6	Fire extinguisher, sand buckets	10,000	10,000
Total		**Rs. 4,60,000/-**	**Rs.4,00,000**

1.10 Environmental Monitoring Program

Environmental Monitoring program will be conducted for various environmental components as per conditions stipulated in Environmental Clearance Letter issued by MOEF&CC & Consent to Operate issued by TNPCB.

Table 1.7 Post Project Environmental Monitoring Program (Construction phase)

S. No	Environment Attributes	Location	Monitoring		Remarks
			Duration	Frequency	
1	Meteorology and Air Quality	Continuous monitoring weather station in core zone/ nearest IMD station	24 hours	Monthly Once	Wind speed, direction, Temperature,Relative humidity and Rainfall.
2	Air Pollution Monitoring – $PM_{2.5}$, PM_{10}, SO_2 and NO_x	5 locations (One station in the core zone and at least one in nearby residential area, one in the upwind, one station on the downwind direction and one in cross wind direction).	8 hours	Once in six months	Fine Dust Sampler and Respirable Dust Sampler
3	Water Pollution Monitoring	No Effluent generation during the construction phase. Set of grab samples during pre and post monsoon nearby ground and surface water in the vicinity.	–	Once in six months	Physico–chemical, micro-biological characteristics
4	Hydrogeology	Water level in open wells in buffer zone around 1km at specific wells	-	During Foundation Work and desilting work	Water level monitoring devices will be used.
5	Noise	Project site Boundary, high noise generating areas within the site due to heavy machineries and at the nearest residential area	24 hours	Monthly Once	Sound level meter
6	Soil	Core Zone and Buffer zone (Grab samples)	–	Once in six months	Physical and Chemical characteristics
7	Loss of flora and fauna	Project site	During Site Clearance	During Site Clearance	Visual inspection
8.	Vibration Test	Project site	-	When the blasting involved during foundation work	Ground vibration test

Table 1.8 Post Project Environmental Monitoring Program (Construction phase)

S. No	Environment Attributes	Location	Monitoring		Remarks
			Duration	Frequency	
1	Meteorology and Air Quality	Continuous monitoring weather station in core zone and in CCA/nearest IMD station	24 hours	Monthly Once	Wind speed, direction, Temperature, Relative humidity and Rainfall.
2	Air Pollution Monitoring – $PM_{2.5}$, PM_{10}, SO_2 and NO_x, CO, SPM	Ambient Air Quality Monitoring 8 locations (Two stations in two villages located in left and right of storage area, 3 random locations in CCA of Cuddalore Districts and 2 random locations in CCA of Mayiladuthurai Districts.	8 hours	Once in six months	Fine Dust Sampler and Respirable Dust Sampler
3	Water Pollution Monitoring	1. Collection of surface water sample in storage area 2. Collection of ground water sample in left and right side of storage area 3. Collection of ground water sample in cultivable command areas.	–	Once in six months	Physico–chemical, micro-biological characteristics
4	Hydrogeology	1. Left and right side of storage area 2. Cultivable command area	-	Once in six months	Ground water levels in MSL
5	Soil	Both agricultural and non agricultural land in core zone and in CCA(Grab samples)	–	Once in six months	Physical and Chemical characteristics
6	Greenbelt development	Project site, village roads, river banks, along the channels	-	Daily	Watering and care taking of plants
7	Agricultural activity	Cultivable command area	-	Yearly once	Both pulses and paddy

1.11 Ecological Damage Assessment, Remediation Plan, Natural Resource Augmentation and Community Resource Augmentation

Environmental Compensation for the construction activity carried out during violation period is computed as follows:

Environmental Compensation, EC = PI × N × R × S × LF

Where

PI = 41 for Orange Category Industry
N = 1419 days
R = Rs.100 (Minimum)
S = 1.0 for cumulatively Small Scale Unit
LF = 1.0 for population less than 1.0 million

EC = 41 x 1419 x 100 x 1.0 x 1.0

EC = Rs. 58,17,900

Table No 11.9 Cost Estimated for Remediation Plan

S.No	Description	Cost
1	Land Reclamation	Rs.11,80,000
2	Cost for medical checkup (300 Workers)	Rs. 3,00,000
3	Cost for Plantation along river banks (500 Saplings) and leaving of fingerlings into water body	Rs. 1,20,000
4	Cost for medical checkup (100 Village people)	Rs. 50,000
5	Plantation along village road, public places (500 Saplings)	Rs. 1,00,000
	Total Cost	**Rs.17,50,000**

Table No 1.10 Natural and Community Resource Augmentation Plan

S. No	Activities	Financial Proposal
Natural Resource Augmentation Plan		
1	Rejuvenation of tributaries of north rajan and south rajan channels in command area	Rs.10,00,000
2	Provision of solar panels arrangements to the nearest houses on both sides of barrage Total number of houses - 20 No.s Solar panel setting/house - Rs.30,000	Rs. 6,00,000
3	Seminars, workshops, panel discussion, brainstorming sessions on topics of strategic importance to agriculture sector in the nearest villages.	Rs. 4,00,000
Total		**Rs.20,00,000**
Community Resource Augmentation Plan		
1	Construction of public toilets in Adhanur and Kumaramangalam villages	Rs.21,00,000
	Total	**Rs 21,00,000**

Total Cost (Remediation Plan + NRAP+CRAP) = Rs. 58,50,000

1.12 Conclusion

As discussed, it is safe to say that the project is not likely to cause significant impact on the ecology and environment of the area, as adequate preventive measures will be adopted to contain the pollutants within permissible limits. The total operation shall be carried out with ease & minimum risk of the workers. The proposed project will definitely increase the agricultural activity around the barrage and in command areas which improve the economic condition of village people and government. The proposed Environmental Management Plan will keep the area in a safe environment with negligible impact on the environment.