Executive Summary

For

"Proposed Construction of MuthamizhArignarDr.Kalaignar Pen Monument in Bay of Bengal off the Coast of Marina Beach near Triplicane Village, Chennai District"

By

Public Works Department

Building Construction Division 1

Chepauk, Chennai-600 005

At

Village:Triplicane

District: Chennai

State: Tamil Nadu

EIA Consultant

HUBERT ENVIRO CARE SYSTEMS (P) LTD

December 2022

Executive Summary

1. Project Description

Proposed Construction of Muthamizh Arignar Dr.Kalaignar Pen Monument in Bay of Bengal off the coast of Marina Beach near Triplicane village, Chennai -600 005.

The pen monument is to be placed in Bay of Bengal off the coast of Marina Beach at a distance of 360 m from the shore line in CRZ-IV (A) area, as per section 4(ii) (j) of CRZ Notification amended on March 22, 2016 for construction of memorials/ monuments and allied facilities by the concerned State.

Project Proponent: Executive Engineer PWD, Building Construction Division I, Chepauk, Chennai 600 005, Tamil Nadu.

The PWD constructs and maintains all the state owned government buildings of public and government utility.

The proposed pen monument requires CRZ Clearance because it involves both onshore and offshore construction. It covers an area about 8551.13sq.m (2.11 Acres). Therefore, it covers CRZ-IVA, CRZ IA & CRZ II.

1.1 Environmental Sensitive Areas

This section details with the environmentally sensitive areas present within the project site and surrounding environs. It included national parks, state forest, essential habitats etc. The environmental sensitive areas covering an aerial distance of 15 km from the project boundary is given in below Table.

<table>
<tr><th>Sr.No</th><th>Areas</th><th>Proposed project location boundary</th></tr>
<tr><td>1</td><td>Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value</td><td>Archaeological places
<table>
<tr><th>S. No</th><th>Monuments</th><th>Distance (~km)</th><th>Direction</th></tr>
<tr><td>1.</td><td>Victory War Memorial</td><td>0.86</td><td>N</td></tr>
<tr><td>2.</td><td>Chaplain’s house including portion which the northern side of the Old WallII/1 Fort St.George</td><td>1.32</td><td>N</td></tr>
<tr><td>3.</td><td>Wellesley House (Built in 1798) Block No.IV/13 Fort St. George</td><td>1.36</td><td>N</td></tr>
<tr><td>4.</td><td>Last house on the left of ‘Snobs Allay’ (oldest house in theFort with carved staircase) – Block No.I/1 Fort St. George</td><td>1.38</td><td>N</td></tr>
<tr><td>5.</td><td>Garrisons Engineer’s Depot Block No.IV Fort St. George</td><td>1.38</td><td>N</td></tr>
<tr><td>6.</td><td>Fort St. George “Arsenal” between Wellesley house and Clive’s House with shells and cannons piled together near the Gateway Block IV/1-12 and 14-18</td><td>1.39</td><td>N</td></tr>
<tr><td>7.</td><td>Nursing Sister’s House (Block 1/3) Fort St. George</td><td>1.43</td><td>N</td></tr>
</table></td></tr>
</table>

		8.	Big Warehouse south of the Church Library (in Block No.II/7) Fort St. George	1.43	N
		9.	Clives House built in 1753 Fort St. George	1.45	N
		10.	St. Mary's Church with tablets laid on the ground and enclosed by a compound and a buried wall Fort St. George	1.47	N
		11.	Guard Room Block No.V Fort St. George	1.56	N
		12.	King's Barracks Block No.XXV Fort St. George	1.65	N
		13.	Old British Infantry Officers Mess (Now housing the Fort Museum) Block No.XXXVI/2 Fort St. George	1.68	N
		14.	Ramparts gates bastions Ravelins with vaulted chambers and water cisterns underneath moat and defense walls all round with glacis to the extent of the existing barbed wire fence Fort St. George	1.87	N
		15.	Tomb of David Yale and Joseph Hymners in the compound of Law College Muthialpet(George Town)	2.42	N
		16.	Old Town Wall Tondiarpet	4.25	N
		17.	Adyar Banyan Tree	6.34	SSW
		18.	Memorial Pillar Anna Salai	7.38	SW
		19.	Madras War Cemetery	11.35	WSW
		20.	Urn burial and megalithic site-St. Thomas Mount	11.99	WSW
		21.	SemmozhiPoonga	3.95	WSW
		22.	Gandhi Mandapam	8.15	SW

2	Areas which are important or sensitive for ecological reasons – Wetlands, Watercourses or other water bodies, coastal zone, biospheres, mountains, forests	

Description	Dist. (~km)	Dire.	Coordinates
Guindy National Park/ RF	8.25	SW	13° 0'21.35"N 80°14'21.55

Water Bodies	Dist. (~km)	Dire.
Bay of Bengal	Within the Site	
Cooum/Kuvam R	0.15	N
Buckingham Canal	0.41	WNW
OtteriNala	4.70	NNW
Adyar R	4.71	SSW
Captain Cotton Canal	6.70	NNW
Kodungaiyur Canal	7.34	N
Korttalaiyar/Kosisttalaiyar R	12.25	N
Pallikaranai Marshland	12.47	SSW
Pulal/Red Hills Lake	14.14	NW
Madavaram/ Retteri Lake	10.73	NW
Velachery Lake	11.29	SW
Korattur Tank	12.20	WNW
Porur Lake	14.76	WSW

3	Areas used by protected, important or sensitive species of flora or fauna	

Water Bodies	Dist. (~km)	Dire.
Bay of Bengal	Within the Site	
Cooum/Kuvam R	0.15	N
Buckingham Canal	0.41	WNW
OtteriNala	4.70	NNW
Adyar R	4.71	SSW

	for breeding, nesting, foraging, resting, over wintering, migration	Captain Cotton Canal	6.70	NNW
		Kodungaiyur Canal	7.34	N
		Korttalaiyar/Kosisttalaiyar R	12.25	N
		Pallikaranai Marshland	12.47	SSW
		Pulal/Red Hills Lake	14.14	NW
		Madavaram/ Retteri Lake	10.73	NW
		Velachery Lake	11.29	SW
		Korattur Tank	12.20	WNW
		Porur Lake	14.76	WSW

4 — Inland, coastal, marine or underground waters

Water Bodies	Dist. (~km)	Dire.
Madavaram/ Retteri Lake	10.73	NW
Velachery Lake	11.29	SW
Korattur Tank	12.20	WNW
Porur Lake	14.76	WSW

5 — State, National boundaries

Nil

6 — Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas

Description	Dist. (~km)	Dire.
Kamarajar Promenade Rd	0.22	W
Nearest SH-114 (Chennai – Manali – Ennore)	1.95	NNW
Nearest NH- (Chennai-Srikakulam)	4.49	NNW

7 — Defence installations

Description	Dist. (~km)	Dire.
INS Adyar	0.81	N
Officers Training Academy (OTA)	11.27	SW

8 — Densely populated or built-up area

Chennai- Site is within the city

9 — Areas occupied by sensitive manmade land uses(hospitals, schools, places of worship, community facilities)

Schools	Dist(~km)	Direc
Triplicane Government Primary School	1.41	W
KendriyaVidyalaya Island Grounds	1.56	NW
Govt Madrasa Higher Secondary School Anna Salai	2.41	W
Dr AmbedkarGoverment Higher Secondary School Egmore	2.64	NW
Govt Hobart Higher Secondary School for muslim girls Royapettah	2.65	WSW
Presidency Girls Higher Secondary School Egmore	3.66	WNW
PurasaiwakkamGovt High School	4.56	NW
Maharishi VidyaMandir Senior Secondary School Chetpet	5.56	WNW
PeramburGovt High School	6.26	NNW

Kodambakkam GHSS	7.58	WSW
KendriyaVidyalaya CLRI Adyar	7.63	SSW
Periyar Matriculation Higher Secondary School	8.42	NW
Ashok Nagar KendriyaVidyalaya	8.76	WSW
KolathurGovt School	10.31	NW
Guindy GHSS	10.61	SW
Mugappair East GHSS	10.99	W
Manali GHSS	11.52	NNW
Velachery GHSS	11.8	SW
PerungudiGovt High School	11.82	SSW
KoratturGovt School	11.99	WNW
ChinnaPorurGHSS	12.77	WSW
KadirveduGovt High School	13.07	NW

Colleges:

Colleges	Dist(~km)	Direc
University of Madras	0.25	W
The Ramanujan Institute for Advanced Study in Mathematics	0.52	W
Presidency college	0.6	SW
Omandurar Government Medical College	0.92	WNW
University of Madras Marina Campus	1.1	SSW
College Of Pharmacy Madras Medical College	1.79	NNW
Esplanade Government Dental College and Hospital	2.1	NNW
Ethiraj College For Women	2.88	W
Women's Christian College	3.92	W
Government Kilpauk Medical College	4.74	WSW
Loyola College Nungambakkam	5.27	W
Pachaiyappa's College	5.68	W
Dr.Ambedkar Government Arts College	6.28	NNW
Anna University	7.31	SW
IIT Madras	7.92	SW
SRM University	8.28	W
St. Anne's Arts and Science College	9.37	NW
Tamilnadu Diploma Horticulture College	10.04	NNW
Dr. M.G.R. Educational And Research Institute	11.64	W
Dr. MGR University	13.58	W
CL BaidMetha College Of Pharmacy	14.01	SSW

Hospitals:

Hospitals	Dist(~km)	Direc
Govt Kasturba Gandhi Hospital for Women and Children	0.99	SW
Tamil Nadu Govt Multi Super Speciality Hospital	1.23	WNW
Rajiv Gandhi Govt General Hospital	1.79	NNW
Govt Central Hospital	2.02	NW

GovtRoyapettah Hospital	2.4	WSW
Chennai Corporation Hospital Othavadi	2.43	SW
Govt eye Hospital Egmore	2.76	WNW
Govt Hospital For Women And children Egmore	3	WNW
Chennai Corporation Hospital Perumalpet	4.09	NW
GovtKilpauk Hospital Chetpet	4.76	WNW
Govt Tuberculosis Hospital Otteri	5.62	NW
Southern Railway Headquarters new Hospital Perambur	6.48	NW
Government Peripheral Hospital Tondiarpet	6.66	N
Govt Hospital Saidapet	8.27	SW
ESIC Hospital KK Nagar	9.2	WSW
Tiruvottiyur Government Hospital	10.3	N
Govt Hospital Tharamani	10.78	SSW
Government Hospital Alandur	11.22	SW
Government Hospital Tiruvottiyur	12.76	N
ChinnaPorur Government Hospital	12.87	WSW
Govt Hospital Attipattu	14.02	WNW

Government Buildings:

Government Buildings	Dist(~km)	Direc
Ezhilagam	0.3	WSW
Commissionerate Of Agriculture Chepauk	0.39	W
Indian Coast Guard Regional Headquarters	0.39	N
PWD Office	0.43	SW
Directorate of Horticulture	0.44	W
Central Industrial Security Force South Sector HQ	0.63	N
Reserve Bank Of India	2.04	N
Chennai Port Trust Centenary Building	2.05	N
State Consumer Disputes Redressal Commission	2.17	NNW
District Registrar Office Royapettah	2.18	WSW
Madras High Court	2.21	N
Tamil Nadu Public Service Commission	2.21	NNW
Regional Passport Office Anna Salai	2.35	W
Chief Metropolitan Magistrate Court Egmore	2.53	WNW
TNUSRB	2.56	WNW
Chennai Lighthouse	2.85	SSW
District Collector Office Chennai	3.4	N
Sub Registrars Office Purasawalkam	4.9	NW
Sub Registrar Office KK Nagar	8.02	W
Saidapet Court	8.53	SW
GuindyTaluk Office	9.57	SW
Alandur Head Post Office	11.84	SW
Alandur Integrated Court	12.56	SW
MaduravoyalTaluk Office	13.23	WSW

<table>
<tr><td>10</td><td>Areas containing important, high quality or scarce resources, (groundwater resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)</td><td>
<table>
<tr><th>Water Bodies</th><th>Dist. (~km)</th><th>Dire.</th></tr>
<tr><td>Bay of Bengal</td><td colspan="2">Within the Site</td></tr>
<tr><td>Cooum/Kuvam R</td><td>0.15</td><td>N</td></tr>
<tr><td>Buckingham Canal</td><td>0.41</td><td>WNW</td></tr>
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<tr><td>Kodungaiyur Canal</td><td>7.34</td><td>N</td></tr>
<tr><td>Korttalaiyar/Kosisttalaiyar R</td><td>12.25</td><td>N</td></tr>
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<tr><td>Korattur Tank</td><td>12.20km</td><td>WNW</td></tr>
<tr><td>Porur Lake</td><td>14.76km</td><td>WSW</td></tr>
</table>
</td></tr>
<tr><td>11</td><td>Areas already subjected to pollution or environmental damage (those where existing legal environmental standards are exceeded)</td><td>Nil</td></tr>
<tr><td>12</td><td>Areas susceptible to natural hazard which could cause the project to present environmental problems, (earthquakes, subsidence, landslides, erosion or extreme or adverse climatic conditions)</td><td>The study area falls under Zone-III (Moderate risk) according to the Indian Standard Seismic Zoning Map. Suitable seismic coefficients in horizontal and vertical directions respectively, will to be adopted while designing the structures.
The place is also prone for Cyclone and Tsunami.</td></tr>
</table>

1.2 Proposed Facilities

Proposed Construction of MuthamizhArignarDr.Kalaignar Pen Monument in Bay of Bengal off the coast of Marina Beach near Triplicane Village, Chennai District. Total area is **2.11 Acres.**

<table>
<tr><th>Sr. No.</th><th>Description</th><th>Details</th></tr>
<tr><td>1</td><td>Location</td><td>MuthamizhArignarDr.Kalaignar Pen Monument in Bay of Bengal off the coast of Marina Beach near Triplicane Village Chennai 600 005, Tamilnadu State</td></tr>
<tr><td>2</td><td>Area Break-up Details</td><td>Total Site area -2.11 acres (8551.13 sq.m)</td></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>Sr.No.</th><th>Description</th><th>Area in sq.m</th></tr>
<tr><td>1</td><td>Pen Pedestal</td><td>2263.08</td></tr>
<tr><td>2</td><td>Pedestrian Pathway Above Sea</td><td>2073.01</td></tr>
<tr><td>3</td><td>Lattice Bridge</td><td>1856.00</td></tr>
<tr><td>4</td><td>Pedestrian Pathway Above Beach</td><td>1610.60</td></tr>
<tr><td>5</td><td>Pedestrian Pathway from MuthamizhArignarDr.Kalaignar Memorial to Bridge</td><td>748.44</td></tr>
<tr><td colspan="2">Total area</td><td>8551.13</td></tr>
</table>
</td></tr>
<tr><td>3</td><td>Project Components</td><td>The following are the components of the project:
➢ Pen Pedestal
➢ Pedestrian cum Glass Walkway
➢ Lattice Walkway
➢ Elevated Walkway</td></tr>
<tr><td>4</td><td>Water Requirement</td><td>Construction Phase :
The total water requirement will be ~ 56 KLD
Domestic : ~ 6 KLD
Construction purpose : ~ 50 KLD
Source of water is through Metro water tankers.
Operation Phase :
Domestic : ~ 5 KLD
Supplied through water dispensers for drinking purposes.</td></tr>
<tr><td>5</td><td>Power Requirement</td><td>Construction Phase :
➢ 500 kV will be sourced from TANGEDCO
➢ 125 kVA for power backup
Operation Phase :
➢ Power supply and DG backup for lighting load
➢ 100 kV will be sourced from TANGEDCO</td></tr>
</table>

6	Manpower Requirement		**Sr.No.**	**Phase**	**Manpower**
			1	Construction	100 Nos per day
			2	Operation	30
7	Road connectivity	Site is well connected through KamarajarSalai, Chepauk.			
8	Proposed Project Cost	INR. 81 Crore			

1.3 Hazardous waste Generation and Management

Hazardous waste materials are properly disposed as per the Hazardous and Other Wastes (Management andTransboundary Movement) Amendment Rules, 2016. Hazardous waste collection, storage & disposal to authorized recyclers.

1.4 Solid waste generation and Management:

Construction Phase: (Manpower: 100 Nos. per day)

- Approximately 45.0 kg/day of municipal waste will be generated in the premises.
- Method of disposal will be through municipal/corporation bins on daily basis.

Operation Phase:

- Approximately, 98 kg/day of municipal waste will be generated in the premises shall be disposed through municipal/corporation bins on daily basis.
- Sanitary facilities inside the existing memorial will be utilized for the proposed project, whose CRZ clearance from TNSCZMA had been vide Proc. No. P1/2462/2021 dated 06.01.2022.

1.5 Wastewater Generation

The Pen Monument is constructed contiguous to the MuthamizhArignarKalaignar Memorial. It is expected that only portion of people visiting the memorial campus would be visiting the Pen Monument structure. The visitors would be using the toilet facilities being provided in the memorial and no exclusive facilities are to be provided for the Pen Monument.

The sewage collected from the toilets which are being constructed for the Kalaignar Memorial would be treated in the STP (tobe installed). Hence no sewage is likely tobe generated for the Pen Monument.

1.6 Decommissioning
Restoration and Rehabilitation

- The site is devoid of any forest or trees and hence there will be no change in the land use pattern and no land acquisition or conversion is required.
- Further, the site is devoid of any human habitations hence evacuation of the project-affected persons is not involved in this project.
- Hence, no resettlement and rehabilitation issues are involved in the proposed project.

2. Description of the Environment

The baseline environmental studies were carried out during **May 2022.**

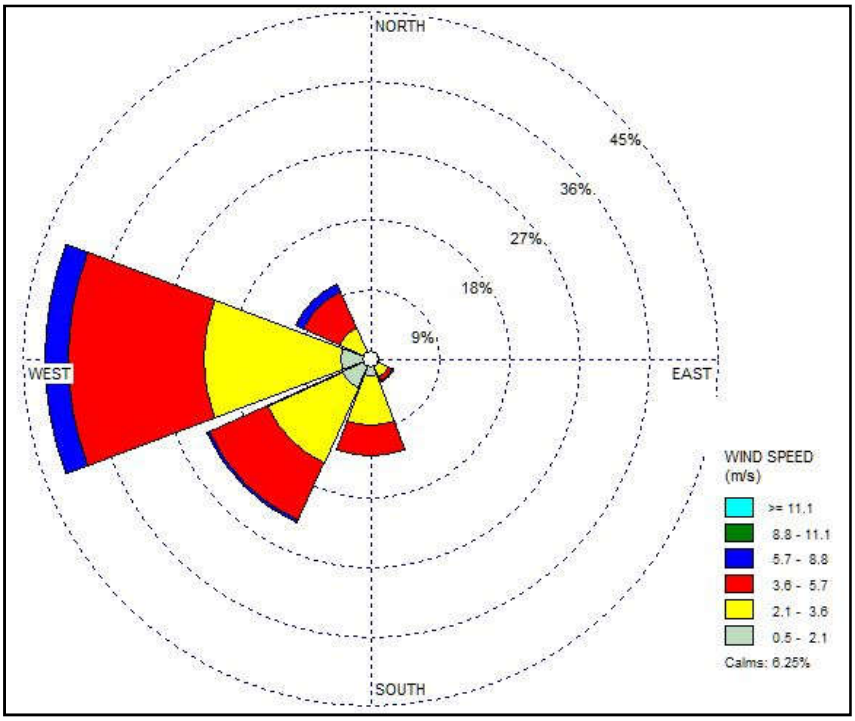
2.1 Climatology

Month	Temp (°C)		Rainfall (mm)		Relative Humidity (%)		Vapour Pressure hPa		Mean Wind Speed (Km/hr)	Predominant Wind Directions (From)*	
	Daily Max.	Daily Min.	Total	No. of days	08:30	17:30	08:30	17:30		08:30	17:30
Jan	29.0	20.5	28.2	1.4	83	64	23.8	22.0	5.5	N	E
Feb	31.0	21.7	4.0	0.4	80	63	25.3	23.6	6.8	W	E
Mar	33.4	23.5	3.3	0.2	76	63	27.7	26.1	8.2	S	SE
Apr	35.7	26.1	11.2	0.7	71	66	30.6	30.2	10.4	S	SE
May	38.0	27.7	46.6	1.7	63	62	29.0	30.2	11.1	SW	SE
Jun	37.4	27.3	74.7	4.9	59	56	26.1	27.6	11.6	W	SE
Jul	35.4	26.2	130.5	7.7	67	60	26.8	27.9	9.9	W	S
Aug	34.5	25.6	145.8	8.4	71	63	27.3	28.4	9.4	W	SE,S
Sep	34.2	25.3	169.2	8.5	74	68	28.8	29.3	7.9	W	SE
Oct	32.0	24.4	293.9	10.0	81	74	29.5	28.9	5.8	W	E
Nov	29.7	22.9	361.6	10.4	83	74	27.5	26.2	5.7	N	N
Dec	28.6	21.5	173.0	6.2	82	69	25.1	23.3	5.9	N	NE
Max.	**38**	**27.7**	**361.6**	**10.4**	**83**	**74**	**30.6**	**30.2**	**11.6**	Annual predominant wind pattern is **WEST**	
Min.	**28.6**	**20.5**	**3.3**	**0.2**	**59**	**56**	**23.8**	**22**	**5.5**		
Avg/Total	**33.2**	**24.4**	**1441.9**	**60.5**	**74.2**	**65.2**	**27.3**	**27.0**	**8.2**		

As per the Climatological data provided observations drawn for the study period are the following.

As per the above IMD Climatological the observations drawn are the following:

- Daily maximum temperature is 38^{o}C and the daily minimum temperature is 20.5^{o}C were recorded in the months of May and January respectively.
- Maximum and minimum relative humidity of 83% and 56% were recorded in the months of January, November and June respectively.
- Maximum and minimum rainfall of 361.6mm and 0.2mm was recorded in the months of November and March respectively.
- Maximum and minimum Mean wind speed is 11.6 Km/hr and 5.5 Km/hr was recorded in the months of June and January respectively. According to the above IMD data, Annual predominant wind pattern is from **West.**



S. No	Parameter	Observation
1.	Temperature	Max Temperature: 37.0°C Min Temperature: 24.0°C Avg Temperature: 29.96°C
2.	Average Relative Humidity	72.49%
3.	Average Wind Speed	3.11 m/s
4.	Predominant Wind Direction	From WEST

2.2 Air environment

The ambient air quality in the study area is given below:

Station Code	Location	Wind Pattern	Distance (km) from Project boundary	Azimuth Directions
AAQ1	Near Project Site	-	0.05	W
AAQ2	Mylapore	c/w	3.36	SSW
AAQ3	Teynampet	c/w	4.12	SW
AAQ4	Thousand Lights	u/w	3.31	W
AAQ5	Pudupakam	u/w	1.85	W
AAQ6	Chetpet	u/w	4.67	W
AAQ7	Purasavakam	c/w	4.25	NW
AAQ8	George Town	c/w	2.67	N

2.3 Noise Environment

S. No	Location	Location Code	Distance (km) from Project boundary	Azimuth Direction	Noise level in dB(A) Leq		CPCB Standard		Environmental Setting
					Day	Night	Lday (Ld)	LNight (Ln)	
1.	Project Site	N1	Within the Site		63.4	50.5	65	55	Commercial
2.	Mylapore	N2	3.36	SSW	67.7	52.3	65	55	Commercial
3.	Teynampet	N3	4.12	SW	63.3	51.7	65	55	Commercial
4.	Thousand Lights	N4	3.31	W	62.8	52.3	65	55	Commercial
5.	Pudupakam	N5	1.85	W	64.3	54.8	65	55	Commercial
6.	Chetpet	N6	4.67	W	68.2	56.2	65	55	Commercial
7.	Purasavakam	N7	4.25	NW	69.5	58.6	65	55	Commercial
8.	George Town	N8	2.67	N	66.3	57.6	65	55	Commercial

2.4 Soil Environment

Location Code	Location	Distance (km) from Project boundary	Azimuth Directions
S1	Project Site	Within the Site	
S2	Mylapore	3.36	SSW
S3	Teynampet	4.12	SW
S4	Thousand Lights	3.31	W
S5	Pudupakam	1.85	W
S6	Chetpet	4.67	W
S7	Purasavakam	4.25	NW
S8	George Town	2.67	N

2.5 Surface water quality

S. No	Name of the Water body	Location Code	Distance from Project Boundary (~Km)	Direction from project boundary
1.	Marine Sample near Project Site	SW1	Within the Site	
2.	Adyar R d/s	SW2	6.62	SSW
3.	Adyar R u/s	SW3	9.31	WSW
4.	Buckingham Canal d/s	SW4	0.46	W
5.	Cooum/Kuvam R u/s	SW5	1.14	WNW
6.	Buckingham Canal u/s	SW6	2.04	NW
7.	OtteriNala	SW7	5.35	NNW
8.	Cooum/Kuvam R d/s (Near Sea Mouth)	SW8	0.18	N

3. Anticipated Environmental Impacts and mitigation measures

3.1 Air environment

Construction Phase:

The major source of air emission are:

- Suspended particulate matter from construction activities (levelling of land, cutting and filling activities)
- Operation of DG sets
- Increased vehicular movement
- Machineries operation equipped for constructing pillars.

Operation Phase:

The sources of fugitive and gaseous emissions are :

- Increase in vehicular movement
- Usage of DG set in case of power failure.

As these emissions are only contented in construction phase, impacts on operation phase are minimal.

Mitigation measures

- Regular sprinkling of water on roads and waste dumps by tankers will be done at frequent intervals
- Construction equipment will be maintained and serviced regularly such that the gaseous emissions from these equipment are maintained within the design specifications; and
- Provision of dust collectors for the drilling machines
- Supply of dust masks for the drill operators

- Plantation of wide leaf trees, creepers, tall grasses around quarry sites, waste dumps, roads, colony and other surrounding barren zones
- The transport vehicles using petrol or diesel should be properly maintained to minimize smoke in the exhaust.

3.2 Noise environment
Construction Phase:

The major sources of noise during the construction phase are:

- Operation of construction equipments such as pneumatic tools, concrete mixers, cranes, generators, pumps, compressors, vibrators, etc., generating noise ranging between 70-85 dB (A).
- Operation of DG sets
- Vehicular movement for construction material conveyance.

Operation Phase:

- The noise generating sources from the proposed project in operation phase is DG set and vehicular movements.
- The noise levels at the source for these units will be in the range of 80-85 dB (A)

Mitigation measures

- Provision for insulating caps and aids at the exit of noise source on the machinery;
- The use of damping materials such as thin rubber/lead sheet for wrapping the work places like compressors, generator sheets;
- Shock absorbing techniques will be adopted to reduce impact;
- Inlet and outlet mufflers will be provided, which are easy to design;
- Earmuffs will be provided to the workers and it should be enforced to be used by the workers;
- No worker will be allowed to expose to more than 90 dB (A) in an 8-hour shift and under no circumstance the noise level from any equipment will be greater than 115 dB (A).
- In order to have less impact on noise levels in the area, the major works will be carried out during daytime as far as possible.

3.3 Soil environment
Construction Phase:

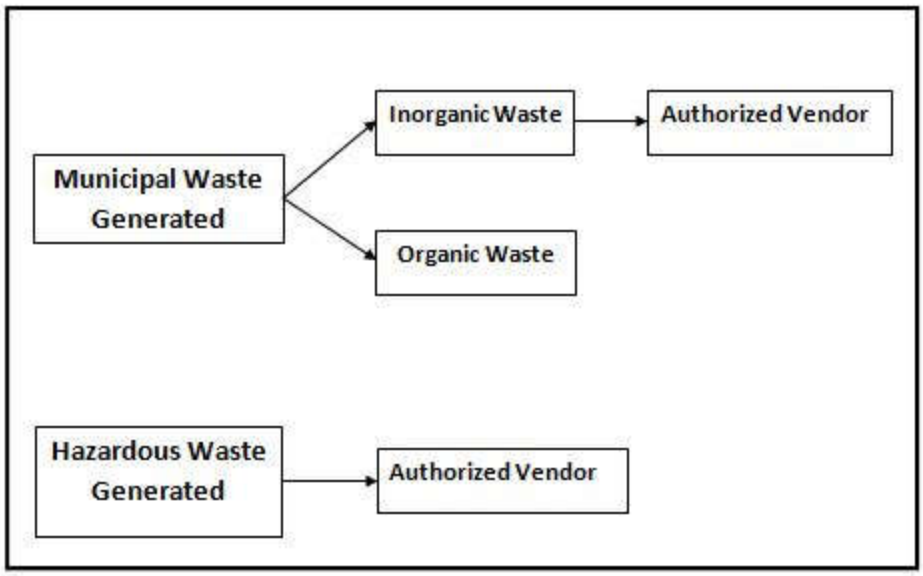
The only major source of impacts due to solid waste generation is the materials such as sand, blue metals, concrete, cement, bricks, etc., used for the construction and the wastes. Approximately 45.0 kg/day of municipal waste will be generated in premises

Operation Phase:

All the impacts related with soil are restricted only to the construction phase; hence there will not be any major impact on soil of the project site during the operational phase.

Mitigation measures

- The solid waste being generated in the premises will be disposed in municipal/corporation bins on daily basis.
- As, no industrial process are involved, so no major quantity of chemicals will be equipped. Moreover, the chemicals equipped will be stored in the proper glass container and labelled accordingly.
- This storage of chemicals would be kept away from the public reach and stored in appropriate room temperature.
- Additional recommendations for the storage would be followed as per CPCB norms.
- Hazardous waste materials are properly disposed as per the Hazardous and Other Wastes (Management and Trans boundary Movement) Amendment Rules, 2016.



3.4 Water environment
Construction Phase:

The major source of impacts on marine water is

- Direct discharge of construction debris.
- Pollution from increased vessel traffic or release of contaminants from seabed sediments.
- Sun light may not penetrate the water resulting in the reduced temperature.
- The temperature influences biochemical processes and deep channels may create zone of poor conductivity that can serve as barriers to migrate for the demersal (living close to the bottom of the sea or a lake) species

Operation Phase:

- The water requirement for operation phase is 5 KLD and it is supplied through the water dispensers.
- The wastewater will be generated only from the sanitation facilities. As, all the sanitation facilities are equipped in the Dr. KalaignarKarunanidhi Memorial (under construction), no adverse impacts are foreseen.

Mitigation measures

The cause and source of water pollution in the area could be attributed mostly to the surface run-off during rainy season. The following mitigation measures are to be taken in controlling the water contamination:

- Construction activities will be suspended during heavy rains
- Construction material shall be properly covered to avoid the leakage and spillage.
- No overburden or loose sediments will be kept in the working benches particularly during monsoon months.
- Public toiletry will be equipped from the adjacent site (Dr. KalaignarKarunanidhi Memorial, which got its clearance in 06.01.2022 and it's under construction), hence no sewage will be allowed to seep into the land.

3.5 Biological environment

Terrestrial Ecology

- The terrestrial ecology here mainly refers to the small grasses as the proposed project site site is devoid of forest or thick vegetation.
- Therefore, no major impacts in terrestrial ecology are foreseen.

Aquatic Ecology

The major source of impacts on aquatic ecology is:

- Dredging activities causing remobilization of contaminants, sedimentation, and increases in suspended sediment concentrations.
- Direct Discharge of construction debris

Mitigation Measures

No sensitive aquatic species are being found in the proposed project site; The pen monument is to be placed in Bay of Bengal off the coast of Marina Beach at a distance of 360 m from the shore line in CRZ-IV (A) area, as per section 4(ii) (j) of CRZ Notification amended on March 22, 2016 for construction of memorials/ monuments and allied facilities by the concerned State. No major aquatic life is being envisaged in the distance of 360 m from the shore line.

3.6 Socio Economic Environment

The requirements of manpower/employment opportunities for construction phase will be 100 Nos. and for operation phase will be 30 Nos.

4. Environmental Monitoring Program

Regular monitoring of important and crucial environmental parameters is of immense importance to assess the status of environment during operational phase. With the knowledge of baseline conditions, the monitoring program can serve as an indicator for any deterioration in environmental conditions due to operational phase and suitable mitigatory steps could be taken in time to safeguard the environment. Monitoring is as important as that of control of pollution since the efficiency of control measures can only be determined by monitoring. The following routine monitoring program will be implemented under the post project monitoring. The proposed monitoring program is given below:

Air Pollution and Meteorological Aspects

Both ambient air quality and DG set emission will be monitored. The ambient air quality will be monitored once in three months in the work zone, at the DG set location and surroundings through a reputed environmental laboratory recognized by CPCB/MoEF. Similarly, the stack monitoring will be carried out and the results will be reported to pollution control authorities.

Wastewater Quality

The sewage emanating from the project will be monitored once in a month for physico-chemical characteristics.

Noise Level

Noise levels near the DG sets will be monitored once in three months.

5. Additional Studies

5.1 Risk Assessment

Generally, risk assessment is estimating; what are the chances (probability) of an accident happening, and if it does happen, what are the chances that someone will be hurt? What will be the extent of equipment or environmental damage, and how bad will it be (severity) The level of risk is dependent on the exposure to the hazard and the probability and consequences of an event occurring.

The steps involved in the risk assessment are:
Carrying out risk assessment in a construction site is much more important to prevent the incidents occurring from it. The following steps can be considered as general measure to carry out the HIRA study.

1. Initiating the HIRA
2. Identify the hazard
3. Identify all parties affected by the hazard and determine how they can be affected
4. Evaluate or assess the risk

EVALUATE OR ACCESS THE RISK

Once the risk and affected persons have been identified, next step is to accessthe risk to protect the people from harm. There must be a defined risk rating to accessthe identified risk.

RISK RATING

One of the most simplistic forms of risk assessment is to rate the remaining risk as high, medium or low; depending on how likely the activity is to cause harm and how serious that harm might be. This is called ‘‘Risk rating’’.

LEVEL OF RISK

Low risk: It is most unlikely that harm would arise under the controlled conditions listed, and even if exposure occurred, the injury would be relatively slight.

Medium risk: These types of risks are ones that could cause issues, but that there is still a lower chance that they will cause your work to fail. It is more likely that harm might actually occur and the outcome could be more serious. Minor injury is a typical example for this kind of risk.

High risk: These are the risks that take the highest priority. They can cause your work to fail, and you need to plan for these risks ahead of time. If injury is likely to arise and that injury might be serious like broken bones, trip to the hospital, loss of consciousness, or even a fatality.

Numerical scores are given to the different elements (e.g. consequence, exposure, likelihood) of risks and these scores are added or multiplied to get a rating for the risk.

5.2 Seasonal Disaster Mapping

Type of Disasters	Vulnerability Mapping	Seasonal Mapping
Flood	The vulnerability of floods at the proposed site would depend on the drainage pattern, sewerage system, and heavy rainfall and others	Mainly from July-September as the responsibility of heavy rainfall, and area affectedbyit
Cyclone, Tsunami	The vulnerability of cyclone, tsunami at the proposed site depends on the north east monsoon winds.	This is a natural calamity that could take place at any point of time. The affect is seen on H, A and I
Earthquake	Proposed site is located in Chennai which falls under Earthquake Zone IV, moderate risk zone, as per the map showing seismic zones of India IS1893(Part-I): 2002.	This is a natural calamity that could take place at any point of time. The affect is seen on H, A and I

Fire	Fire accidents could take place due to improper maintenance of electrical wiring, faulty wiring and gas leakage etc. Carelessness is one of the major factors for fire hazards.	It can occur at any point of time and H,A and I are affected by it

H: Human, A: Animals, I: Infrastructure

The proposed project is located in Chennai. It could face various challenges from both natural and man-made hazards as highlighted in previous section. Some of the precautionary measures that could be taken in case of disasters in terms of social aspects are highlighted in consequence section of this chapter.

5.4 Bathymetry Survey

HECS conducted a bathymetric survey using a fishing boat on September 2, 2021, at 7 a.m. The bathymetric survey in the sea, proportionate to the Dr.KalaingnarKarunanithi Monument, near marina beach, has been carried out by a team from the HECS, IITM and Pacific Blu Subsea services. The survey will cover a distance of 500 meters from the shoreline, up to a depth of 17.46 meters and 10-12 bathymetric transects. The bathymetric survey was sub-contracted, using Edgetech 4125 Portable Digital Side Scan Sonar (400/900 KHz).

5.5 Findings of Bathymetric Study

The table below shows the distance from sea shore and corresponding depth for considering the suitable location for the monument.

Distancefromshore(m)	Depth(m)
50	1.88
100	1.85
150	1.58
200	1.57
250	3.40
300	4.50
350	5.77
360	**6.00**
400	6.80
450	7.80
500	9.10

6. Project Benefits

6.1 Improvement in the Physical Infrastructure

- The proposed project will enhance tourism and will be a great privilege to the late chief minister MuthamizhArignarDr.Karunanidhi for his tremendous contribution in improvising the welfare of the people in Tamil Nadu.
- To create an environment that could support the culture of good standards;
- To enhance aesthetics profile of the area due to Green Belt, Landscape and Water fountain.

6.2 Financial Benefits of the Project

As the proposed site is tourism attractive one, moreover it is situated in the prime location of the Chennai district. The population influx would be high along with the direct and indirect employment generation which would subsequently increase the financial status of the particular region.

6.3 Social Benefits of the Project

The significance of the proposed site is to symbolize the remembrance of tremendous contribution of Dr. KalaignarKarunanidhi in the various fields of literature, art, social works, politics and cinema industry. This will indent the minds of people to enhance their morality.

7. Environmental Management Plan

Sr.No.	Parameters	Impacts on Construction Phase	Impacts on Operation Phase	Mitigation Measures
1.	Air Environment	Main sources of Air Pollution construction phase are noted as: Vehicular movement Construction activities. Operation of DG Set.	The source of air pollution during Operation Phase are: Stand by DG set Increased Vehicular Movement	Sprinkling of water will be done at frequent intervals, for eliminating the fugitive dust from material handling and vehicle movements. Construction equipments will be maintained and serviced at proper intervals to regulate the gaseous emissions in accordance with design specifications. Construction activities will be restricted to daytime only as much as possible to minimize disturbance during night time
2.	Water Environment	The water requirement for construction phase is 56 KLD. Sprinkling on roads for	Wastewater will be generated only from the sanitation facilities and will be treated in	Toilets available in the MuthamizhArignar Dr. Kalaignar Memorial (whose CRZ Clearance from TNSCZMA had been vide Proc. No.P1/2461/2021 dated

		dust suppression Workmen will use the existing toilet in memorial	proposed STP (10 KLD) in memorial.	06.01.2022, under construction) will be utilized for the proposed sewage generated during the operation phase
3.	Noise Environment	Operation of construction equipments such as pneumatic tools, concrete mixers, cranes generators pumps, compressors, vibrators etc are the major source of noise pollution	Noise generating sources from the proposed project is DG set only. Noise level at the source for these units will be in the range of 80-85 dB (A).	Provision for insulating caps and aids at the exit of noise source on the machinery. The use of damping materials such as thin rubber/lead sheet for wrapping the work places like compressors, generator sheets. Shock absorbing techniques will be adopted to reduce impact. Inlet and outlet mufflers will be provided, which are easy to design. Earmuffs will be provided to the workers and it should be enforced to be used by the workers. Noise prone activities will be restricted to the extent possible during night time, particularly during the period between 10 pm to 6 am in order to have minimum environmental impact on the workers. No worker will be allowed to expose to more than 90 dB (A) in an 8-hour shift and under no circumstance the noise level from any equipment will be greater than 115 dB (A)
4.	Social Environment	Generation of direct and indirect employment	Tourism attraction site.	**Construction Phase:** The Lattice Bridge is designed in

		The Pen Monument is proposed tobe constructed mainly as on offshore structure. However this structure does not lie in the main local fishing routes and hence the fishing activities are not affected due to this structure.	There are only positive impacts witnessed; like employment Aesthetic value will be increased.	such way that the movement of fishing boats are not hindered in any way. Construction activities will be temporary in nature and it would be fully mitigated where the construction waste materials (debris) will be segregated and disposed by the contractor and will ensure the debris won't accumulate in the water bodies. **Operation phase:** First Aid: First aid facilities will be maintained at a readily accessible place where necessary appliances including sterilized cotton wool etc will be available. Ambulance facilities will be kept readily available at workplace to take injured person to the nearest hospital. Potable Water: Sufficient supply of water fit for drinking will be provided at suitable places. Security: Security persons will be appointed 24 x 7 at the project site.
5.	Soil Environment	Dripping of oil from construction vehicles might cause soil contamination	Nil	Proper inspection and maintenance of vehicles and construction machineries will be done to avoid any oil spillage.

6.	Marine Ecology	Due to the construction activities, the sea bed will be disturbed due to concreting work.	All the impacts are restricted only to construction phase.	Construction activities carried will be temporary in nature and it would be fully mitigated where the construction waste materials (debris) will be segregated and disposed by the contractor and will ensure the debris won't accumulate in the water bodies.
7.	Land Environment	Only minor land impacts are envisaged.	There will be an immense positive impact on the land use pattern of the proposed project site due to the project and the aesthetics will be improved impressively.	There will be minimum/optimum concreting of the top surfaces.
8.	Terrestrial Biodiversity	No major impacts are envisaged during construction phase. As, there are only small grass which shall be removed during leveling.	The positive impact on the biodiversity will be due to aesthetics and greenbelt landscaping.	The proper landscaping will mitigate the any adverse impacts. A greenbelt programme will improve the ecological condition of the region.