Initial Environmental Examination

Document Stage: Draft for Consultation Project Number: 49107-009 June 2021

INDIA: Integrated Urban Flood Management for the Chennai - Kosasthalaiyar Basin Project – PART B

Prepared by Greater Chennai Corporation (GCC) for the Asian Development Bank.

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Infrastructure	Location and Environmental Features					
	National Highway–5 (Near	Siva Parvathi Nagar main road, Zone-VI				
	Madhavaram), Zone-III lies in	lies in residential area and proposed drain				
	commercial area and proposed drain will	will be constructed in the left side of the				
	be constructed in the right side of the	road. Nearby landmark of Redhills road				
	road under the foot path. Nearby	exist at a distance of 70m. There are no				
	landmark are Madavaram MTC Bus	environmentally sensitive areas located				
	Depot and Moolakadai Market Bus Stop	nearby the proposed drain.				
	at a distance of 150m and 450m					
	respectively. There are no					
	environmentally sensitive areas located					
	nearby the proposed drain.					
Surplus	Ambattur Surplus Drain. Total length	Korattur Surplus Drain. Total length of				
Drains	of the drain is 5.79km. This canal links	the drain is 2.13km. This canal links				
	Ambattur lake with Korattur lake. It	Korattur lake with Retteri lake. It traverses				
	traverses through the railway line (in-	through the Chennai Bypass Road				
	between the settlements) There are no	(Connecting Perungalathur to Puzhal)				
	environmentally sensitive areas located	There are no environmentally sensitive				
	nearby The surplus drain is seasonal	areas located nearby The surplus drain is				
	which remains dry during the summer	seasonal which remains dry during the				
	season The proposed interventions	summer season The proposed				
	includes.	interventions includes.				
	Removal of silt	Widening of canal				
	Modifying existing bed to design	 Modifying existing bed to design 				
	bed level	bed level				
	Construction of RCC side walls	Removal of silt. weeds				
		Construction of RCC side walls				
	the second se					
		A Supering Constant of the				
	View of Ambattur Surplus drain View of Korattur Surplus drain					
	Kadanakkam Surnlus Drain The total Arivalur Surnlus Drain The total length					
	length of the drain is just 0.68km (680m):	of the drain is 2 65km: It connects Arivalur				
	It connects Kadapakkam lake with	lake with the Kosasthalaivar river It				
	Arivalur lake It traverses through	traverses through agriculture land. The				
	agriculture land the surplus drain is	surplus drain is seasonal which remains				
	seasonal which remains dry during the	dry during the summer season. There are				
	summer season There are no	no environmentally sensitive areas located				
	environmentally sensitive areas located	nearby				
	nearby	Removal of silt weeds				
	Removal of silt weeds	Modifying existing had to DWD				
	Modifying evicting had to DWD	Initiality ing existing bed to PWD				
	bed levels					
Storm Wator	Karail Nagar Pumping Station is locat	 ed in Zone Ward No 7 (N13 17/605				
Pumping	E80.291116)					

Infrastructure	Location and Envi	ronmental Features				
Station at	The nearest residential area/ settlement	is located at a distance of 100m from the				
Karghil Nagar	proposed Pumping Station (PS)There are no environmentally sensitive areas located					
	within or nearby the pumping station site. However, the proposed PS site falls under					
	the CRZ II, due to the tidal influence in the Buckingham canal, which is located less					
	than 15m. The storm water collected in the Kargil nagar pumping station will be					
	discharged into the Buckingham Canal.					
	Existing SWPS at Karghil Nagar	Proposed SWPS Site				
Storm Water	Eranavoor Pumping Station is located	I in Zone I, Ward No 4. (N13.190405,				
Pumping	E80.302826)					
Station at	The nearest residential area/ settlement	is located at a distance of 30m from the				
Ernavoor	proposed Pumping Station (PS). There are within or nearby the pumping station site. the CRZ II, due to the tidal influence in th than 15m. The storm water collected i discharged into the Buckingham Canal.	e no environmentally sensitive areas located However, the proposed PS site falls under he Buckingham canal, which is located less in the Eranavoor pumping station will be				
	Proposed SWPS	Site at Eranavoor				

VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

107. The potential environmental impacts of the proposed storm water drain project, and its components are presented in this section. Mitigation measures to minimize/mitigate negative impacts, if any, are recommended along with the agency responsible for implementation. Monitoring actions to be conducted during the implementation phase is also recommended to reduce the impact.

108. Screening of potential environmental impacts is categorized into four categories considering project phases: location impacts and design impacts (pre-construction phase), construction phase impacts and operations and maintenance phase impacts.

- (i) **Location impacts** include impacts associated with site selection and include loss of on-site biophysical array and encroachment either directly or indirectly on adjacent environments. It also includes impacts on people who will lose their livelihood or any other structures by the development of that site.
- (ii) **Design impacts** include impacts arising from Investment Program Design, including technology used, the scale of operation/throughout, waste production and ancillary services.
- (iii) **Construction impacts** include impacts caused by site clearing, earthworks, machinery, vehicles, and workers. Construction site impacts include erosion, dust, noise, traffic congestion, and waste production.
- (iv) **O&M impacts** include impacts arising from the operation and maintenance activities of the infrastructure facility. These include routine management of operational waste streams, and occupational health and safety issues.

109. Screening of environmental impacts has been based on the impact magnitude (negligible/moderate/severe – in the order of increasing degree) and impact duration (temporary/permanent).

110. This section of the IEE, reviews possible project-related impacts, to identify issues requiring further attention and screen out issues of no relevance. ADB SPS (2009) require that impacts and risks will be analyzed during pre-construction, construction, and operational stages in the context of the project's area of influence.

111. The ADB Rapid Environmental Assessment Checklist in <u>http://www.adb.org/documents/adb-environmental-assessment-guidelines</u> has been used to screen the project for environmental impacts and to determine the scope of the IEE.

112. In the case of this project (i) most of the individual elements involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant; (ii) negative impacts associated with stormwater drain facilities are already considered in the design; (iii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and (iv) being mostly located in an urban area, will not cause direct impact on biodiversity values. The project will be in properties held by the GCC and access to the project location is through public rights-of-way and existing roads hence, land acquisition and encroachment on private property will not occur.

A. Pre-Construction Impacts – Design and Location

113. **Design of the Proposed Components**. Technical design of the (i) storm water drain network, and (ii) storm water pumping stations, follows the relevant standards and provides a robust system, which is easy to operate, sustainable, efficient and economically viable. Project includes following design considerations:

- (i) Prevention of flooding. Rainfall data of 46 years are collected and based on that the storm water drainage system of micro drains are designed to handle the maximum rainfall of 70 mm/hour for 2 years return period. Macro drains and surplus canals connecting all major lakes are designed to handle the maximum rainfall of 106 mm/hour for 5 years return period.
- (ii) Groundwater recharge and silt control. Rainwater harvesting through constructing catch pits and rainwater harvesting structures are proposed in the storm water drainage network. Catch pits at every 10m interval and Rainwater harvesting structure along with a silt catching pit will be provided at every 30m interval in the proposed/rehabilitated drains. The provision includes FRC Grating Cover with frame and coarse sand for filter media inside the pit.
- (iii) Sediment Control. For control of sediments, it is proposed to construct a sediment trap at the confluence point of the drain with the water body so that the sediments are deposited in the silt trap and settle over there which can be removed periodically. Additional silt traps will be provided at the point where the crossdrainage confluence and the silt from these silt traps shall be periodically removed.



Figure 27: Catch pit section with RWH structure in Storm Water Drain

(iv) Prevention of solid waste dumping into drains. Micro drains will be constructed as box type drain in RCC with a cover on top, which will curtail dumping of solid waste in drains. Major macro drains belonging will be constructed as open drains with both side cover in MS frame with wire mesh to avoid dumping of solid waste.

114. **Safety in maintenance.** Inspection doors will be provided at an interval of 10m to facilitate maintenance activities by machinery.

115. **Traffic Loads and People access to micro drains.** Micro drains shall be constructed as box type drain in RCC with a cover on top, which can also take traffic loads.

116. **Storm water-pumping stations**. It is proposed to construct two storm water pumping stations that will receive storm water from the catchment area via the drain network and pump to North Buckingham Canal as per the design. The pumping station will consist of a storm water sump or suction well to receive storm water, vertical turbine pumps in the sump to pump out, and electrical panel board for operation of pumps above the ground (the height will be fixed based on the HFL). A generator set will also be provided at each pumping station of the required size. In order to protect the pump house from flooding, the electrical motor control and power panels will be fixed in an elevated level.

117. At these pumping stations, the operation involves accumulation of incoming storm water in the sump and then pumping out as the storm water level reaches the designed operating depth. The water level in the sump rises before the pumping cycle starts, and as the pumping is performed the water level goes down, registering its lowest depth at the end of the pumping of a cycle. During the monsoon period, this cycle of rising and lowering will continue throughout the day and night, however, the duration between successive pumping cycles will significantly vary depending on the storm water generation/intensity of rainfall.

118. Storm water pumping stations will require an uninterrupted power supply for operation. Disruption in power supply will lead to the process upset and result in the stagnation of storm water in low-lying areas. Following measures are integrated into design and contracts to ensure efficient operation:

- (i) Ensuring continuous uninterrupted power supply, including a back-up facility (such as a generator)
- (ii) Providing operating manual with all standard operating procedures (SOPs) for operation and maintenance of the facility
- (iii) Necessary training to GCC staff dealing with the pumping station.

119. Proposed pumping stations are located at Kargil Nagar and Ernavoor, adjacent to the eastern portion of the North Buckingham Canal. The proposed site is surrounded by vacant land and the nearest settlement area/ residential area is at about 100m from the Kargil Nagar site and 30m from the Ernavoor site.

120. **Noise from pumping operations**. Proposed pumping stations are located at Kargil Nagar and Ernavoor, adjacent to the eastern portion of the North Buckingham Canal. The proposed site is surrounded by vacant land and the nearest settlement area/ residential area is at about 100m from the Kargil Nagar site and 30m from the Ernavoor site. The operation of pumps and motors and diesel generators is a major source of the noise. As the pumping stations are located in the vacant areas, noise generated from pump stations cannot have continuous negative impacts on the surrounding population. High noise levels can affect the health of operators and staff at the facilities, and therefore, noise levels need to be maintained within and outside the plant at acceptable levels. The internal noise level in a room measured at a distance of 1m from these pump sources typically will be in the range from 80 dB (A) to 100 dB (A).

- (i) Procure good quality latest technology vertical turbine pumps that guarantee controlled noise at a level of around 80 dB(A) at a distance of 1 m (refer tender specification for make)
- (ii) Use acoustic enclosures manufacturer specified, for all pumps, motors

- (iii) Procure only CPCB approved generators with low emission and low noise fitted with acoustic enclosures
- (iv) Provide sound mufflers for ventilators in the plant rooms soundproof doors
- (v) Provide earplugs to workers.

121. **Energy Efficiency**. To optimize the power consumption, it is proposed to use low noise and energy-efficient pumping systems.

122. **Tree cutting at selected project sites**. It is estimated to cut/remove 304 trees located adjacent to the micro/macro drains, which belong to species such as *Pongamia Pinnata* (Pungai), *Azadirachta Indica* (Neem Tree) and *Cocos Nucifera* (Coconut Tree). Adequate precaution will be taken during implementation to minimise the tree cutting. Tree transplantation option shall be explored to minimize the loss of trees. However, when tree cutting is unavoidable, a note with necessary details of the project, trees & photos and justification for tree cutting needs to be submitted to the respective Regional Deputy/ Joint Commissioner, GCC, for obtaining tree cutting permission. Tree cutting will be carried out by the Parks Department, GCC before the start of work.

123. **Compensatory Plantation.** Plant and maintain 10 trees for each tree that is removed. Trees shall be planted in the nearby parks belongs to GCC and are furnished in **Appendix 10**.

Scientific Name	Local Name	Habit	Planting Zones			
Saline tolerant species						
Calophyllum inophyllum	Punnai	Т	Kosasthalaiyar and Buckingham canal bunds			
Pongamia pinnata	Pungai	Т				
Terminalia catappa	Naattu Badaam	Т				
Thespesia populnea	Poovarasu	Т				
Salvadora persica	Peruvilla	Т				
Vettiveria zyzanioides	Vettiver	G				
Cleradendrum inerme	Peenari	S				
Caesalpinia bonduc	Kalichchikkai	S				
Terrestrial Species			Places of no saline Influence			
Albizia lebbeck	Vaagai	Т				
Albizia odoratissima	Karuvaagai	Т				
Azadirachta indica	Veppam	Т				
Aegle marmelos	Vilvam	Т				
Barringtonia acutangula	Neerkadambu	Т	Places of no saline Influence			
Bauhinia tomentosa	Vellai mandaarai	Т				
Bauhinia purpurea	Mantharai	Т	Places of no saline Influence			
Bauhinia recemosa	Athi	Т	Places of no saline Influence			
Butea monosperma	Porasu, Murukku	Т				
Couroupita guianensis	Cannonball	Т				
Crataeva adansonii	Mavalingam	Т				
Cassia fistula	Sarakondrai	Т				
Dalbergia lanceolaria	Erigei, Nalvellangu	Т				
Diospyros ebenum	Karungali	Т				
Ixora pavetta	Chulundu	Т				
Morinda citrifolia	VellaiNuna	Т				
Mimusops elengi	Magizham	Т				
Millingtonia hortensis	Mara Malli	Т				

 Table 38: List of Species for Compensatory Tree Plantation

Scientific Name	Local Name	Habit	Planting Zones
Peltophorum pterocarpum	Perunkonrai	Т	
Putranjiva roxburghii	Irukolli	Т	
Saraca indica	Asokan		
Terminalia arjuna	Neer Marudhu	Т	
Terminalia bellirica	Thani, Thandri	Т	
Vettiveria zyzanioides	Vettiver	G	

124. **Impacts on Biological Environment.** The project is unlikely to change or influence biological environment, flora and fauna of the region as most of the area falls under the urban and peri-urban regions. The influence of the linking canal and the trees, herbs and shrubs cleared for the purpose is minimal. The project is expected improve the overall drainage and flood system and will interconnect the water bodies within the project area, which will meet the environmental water need within and around the project area. This in turn will contribute positively to biodiversity of the region. Project will improve the microclimatic conditions in long-term and can contribute to mitigating the climate change impacts. Project is unlikely to cases any structural changes in long run, such as change in the topography, geology, soil, temperature and vegetation, and combination of any of these components.

125. Project area is located on the Coromandel coast of the Bay of Bengal, and due to topography, the storm water ultimately flows into sea. The project will not alter this situation. In the existing condition, high siltation and entry of wastewater into coastal water are some of the main issues that affected the coastal areas, including the current highly degraded state of Ennore Creek. This project will positively contribute to improve the situation. Nearly 60 km of storm water drain network, 2 pumping station and some discharge points fall within the CRZ area, and works cannot be initiated until the clearance from TNSCZMA is obtained.

126. Project is unlikely to have any significant impacts on Ennore Creek which is located on the far end of the project area, and that receives storm water / runoff from the project area. Ennore Creek was once a biodiversity hotspot and now highly degraded due to various urban and industrial activities in the surroundings. Any changes in water quality of creek during and after monsoon and cyclonic events including, temporary increases in the concentration of more pollutants and toxics levels, will affect the coastal estuarine ecosystems. The project however likely to have positive impact on the creek as it will improve quality of water flowing into the creek. Besides desilting of canals and drains and providing proper storm water drainage system, the proposed project design also considers minimizing the silt flow in the system (via silt traps) that ultimately ends up in inland and/or coastal waters. With the sewerage projects planned and implemented by CMWSSB in the project area, and with strict enforcement to prevent illegal wastewater entry into the storm water drains, the project will benefit the terrestrial and coastal environment greatly in a long run.

127. There may be physical impacts on coastal habitats due to erosion and deposition associated with frequency and volume of runoff that alters estuarine habitat. As stated above, this project will avoid excess siltation, and therefore this impact is likely to be insignificant. Sediments will be trapped along the drains and removed. There is no excess sediment load carried during heavy flood from the project area that may have impact on the benthic diversity of the estuary. Since the ecological system is already under huge stress due to the industrial and domestic pollution, the project will improve the existing condition positively.

128. The sudden discharge of fresh water into the estuarine system may cause short term impact and shock on the estuarine biodiversity. This impact is unlikely as the proposed project

will not alter the flow volumes from the baseline condition. Project will only facilitate smooth functioning of the existing system, by provision of new drains, repairing of existing drains, and restoring connections etc. In fact, the proposed system will avoid sudden discharge of fresh water into estuary or coastal waters, as it will enhance the holding capacity of inland water bodies and streamline the functioning of the drainage system. There will be less likelihood of flooding, and no requirement of sudden discharge via pumping during monsoons.

129. Water quality of Kosasthalaiyar River, Surplus channels, Buckingham and Ennore creek will be tested pre, during and post construction and operation phase to monitor the changes in water quality as per the baseline condition.

130. **Utilities**. The site preparation for construction may result in loss or relocation of certain utilities and amenities namely telephone lines, electric poles, and wires, water, and sewer lines, if exists within the proposed project locations may require to be shifted. People dependent upon these utilities and amenities may experience inconvenience and economic loss. To mitigate the adverse impacts due to relocation of the utilities, the contractor, in collaboration with the GCC will

- (i) identify the locations and operators of these utilities to prevent unnecessary disruption of services during the construction phase;
- (ii) instruct construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services, and
- (iii) Contractor to provide prior (at least 1 week) information to public on likely utility service disruptions, and contingency measures to be put in place.

131. **Social and Cultural Resources – Chance find protocol**. Any work involving ground disturbance can uncover and damage archaeological and historical remains. For this project, excavation will occur in project sites construction of drains and pumping stations. Although Chennai has rich history and heritage, the project areas which is an extended area of the Greater Chennai Corporation in its northern limits, is not known to have places of archeological or historical or cultural importance. Therefore, potential of discovering such remains may be very low. However, following protocol will be in place to account for any chance finds. GCC and its contractor needs to follow chance find protocol to ensure that any chance finds are recognized, and measures are taken to ensure they are protected and conserved.

- (i) Construction contractors should follow chance find measures in conducting any excavation work
- (ii) Create awareness among the workers, supervisors and engineers about the chance finds during excavation work
- (iii) Stop work immediately to allow further investigation if any finds are suspected;
- (iv) Inform archaeological department / ASI if a find is suspected and take any action that they require to ensure its removal or protection in situ.

132. Site selection of construction work camps, stockpile areas, storage areas, and disposal areas. Priority is to locate these near the project location. However, if it is deemed necessary to locate elsewhere, sites that are to be considered will not promote instability and destruction of property, vegetation, irrigation, and drinking water supply systems. Residential areas will not be considered for setting up construction camps to protect the human environment (i.e., to curb accident risks, health risks due to air and water pollution and dust, and noise, and to prevent social conflicts, shortages of amenities, and crime). Extreme care will be taken to avoid disposal near water bodies.

133. **Site selection of sources of materials**. Significant quantities of coarse aggregate and fine aggregate will be required for construction works. The contractor should procure these materials only from the approved quarries. The contractor should, to the maximum extent possible, procure material from existing quarries, and the creation of new quarry areas should be avoided as far as possible. If new quarries are required then the contractor will be responsible for obtaining all permissions and clearances, including environmental clearance for mining. The contractor should factor the time required for obtaining clearances including the conduct of EIA if required under the law. It will be the construction contractor's responsibility to verify the suitability and legal status of all material sources and to obtain the approval of the Department of Geology and Mining and local revenue administration, as required.

B. Construction Impacts

134. Civil Works include the construction of stormwater drains along roadsides and stormwater pumping stations at Kargil Nagar and Ernavoor. These works will be confined to sites, and construction will include general activities like site clearance, excavation, construction of drains, disposal of surplus earth and creation of concrete structures for stormwater pumping stations with electromechanical installations. Since these works are confined to the sites, there is no direct or significant interference of construction work with the surrounding land use. However, construction dust, noise, use of local roads for transportation of construction material, waste, labour camps, etc., will have negative impacts, which need to be avoided or mitigated properly. Drains will be constructed by the open cut method. Open cut trenching method of construction of drain involves trench excavation in the road, construction of drains, refilling with the excavated soil and disposal of surplus earth. All drains will be of RCC with size range from 0.60 x 0.75 m to 10.0 x 2.0 m. Proposed Drain sizes are given in the following table.

SI No.	Drain Size (m)	Length (km) (new + rebabilitation / replacement)
1	0.6X0.75	146.49
2	0.9x0.9	310.30
3	0.9x1.05	1.48
4	0.9x1.2	0.18
5	1.2x1.2	29.23
6	1.5X0.9	71.51
7	1.5x1.5	62.34
8	1.8x1.5	22.54
9	1.8x1.8	16.97
10	2X1.5	12.10
11	2x2	24.51
12	2x3	0.54
13	2.5x1.5	0.37
14	2.5x2	8.99
15	2.5x2.5	1.52
16	3X1.5	1.90
17	3X2	13.33
18	3x2.5	0.06

Table 39: Proposed Drain sizes

SI No.	Drain Size (m)	Length (km) (new + rehabilitation / replacement)
19	3x3	1.17
20	3.5X2	2.42
21	3.5x2.5	0.23
22	4X2	5.86
23	5x2	10.64
24	5X2.5	3.20
25	5x3	1.27
26	6x2	7.43
27	7X2	0.51
28	7x2.5	1.23
	Total length	758.34

135. Earthwork excavation will be undertaken by machine (backhoe excavator) and include danger lighting and using sight rails and barricades. The work will also be supplemented manually where there is no proper working area (e.g., very narrow streets) for the backhoe excavators. Excavation and digging of trenches during construction had the potential to cause erosion and cave-ins thereby causing soil erosion, silt runoff and unsettling of street surfaces. Unorganized disposal of the excavated earth can disturb the street surface and decrease the aesthetic and economic values of the area. The activity will be a discomfort to the road users and inhabitants.

136. During construction, precautionary measures will be taken; proper backfilling trenches will be done. Temporary access, diversions, and signboards for pedestrians will be provided. Surplus excavated earth will be disposed to Kodungaiyur dumping yard.⁷

137. **Site Preparation.** The clearance of site shall involve the removal of all materials such as trees, bushes, shrubs, stumps, roots, grass, weeds, part of topsoil and rubbish. Towards this end, the Contractor shall adopt the following measures:

- (i) Limiting the surface area of erodible earth material exposed by clearing and grubbing;
- (ii) Conservation of top soil and stock piling and
- (iii) Carry out necessary backfilling of pits resulting from uprooting of trees and stumps with excavated or approved materials to the required compaction conforming to the surrounding area.

138. **Sources of Materials**. The source of water for construction shall be arranged by the Contractor through the Tamil Nadu Water and Drainage Board and/or GCC. About 4,50,000 cum amount of sand and about 8,90,000 cum of coarse aggregate will be required for this project, which will be sourced from approved quarries. Quarries inevitably cause extensive physical changes; as construction materials are excavated from the ground, leaving large cavities, or leveling hillsides, etc. The physical damage caused by quarries is controlled by allowing them to operate within specific limited areas only, so the damage is restricted in extent and not allowed to spread indiscriminately. New quarries are subject to a rigorous process of environmental assessment to ensure appropriate siting and adequate environmental controls on the operation.

⁷ Owned and managed by Chennai Corporation.

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It will, therefore, be important to ensure that construction materials for this project are obtained from government-approved licensed quarries only, to ensure these controls are in place. The contractor should avoid new borrow pits/quarries as far as possible, if necessary, all the permissions, including the conduct of environmental assessment, and environmental clearance as necessary shall be obtained before the start of quarrying activity. The contractor should also make a concerted effort to re-use as much excavated material from this project as possible. The construction contractor will be required to:

- (i) Obtain construction materials only from government-approved quarries with prior approval of PIU
- (ii) PIU to review, and ensure that proposed quarry sources have all necessary clearances/ permissions in place prior to approval
- (iii) Contractor to submit to PIU every month documentation on material obtained from each source (quarry/ borrow pit)
- (iv) Avoid the creation of new borrow areas, quarries, etc., for the project; if unavoidable, contractor to obtain all clearances and permissions as required under law, including Environmental Clearance (EC) prior to approval by PIU.

139. **Disposal of excess earth/ surplus materials and debris.** The proposed construction activities), shall generate an estimated 2 million cubic meters of surplus earth and debris. The possibilities of recycling the surplus earth for the construction purposes shall be explored, and unutilized surplus earth materials, will be disposed / dumped in the Kodungaiyur dumping yard (which is owned and managed by Chennai Corporation). Zone wise the estimated quantity of the surplus materials/ excess earth is given in the following table.

Sl.no	Zones	Quantity in cu.m
1	Zone A	15,302
2	Zone B	161,186
3	Zone C	75,957
4	Zone D	321,020
5	Zone E	281,585
6	Zone F	5,617
7	Zone G	180,204
8	Zone G -P	310,663
9	Zone H	76,779
10	Zone H - P	140,566
11	Zone I	286,342
12	Zone J	108,071
13	Zone K	51,716
	Total	2,015,007

Table 40: Zone wise Surplus Earth Quantity

140. Proposed desilting of drains and surplus canals is likely to generate nearly 150,000 m³ of sediment/silt. As per the sediment analysis presented in Description of the Environment Section, silt/sediment does not contain hazardous materials. It can be reused in construction purposes or the excess shall be disposed in the Kodungaiyur dumping yard and Perungudi Dump Yard of GCC. However, during the construction, the property of sediment shall be rechecked, if it is found to be hazardous, it will be disposed at a hazardous waste disposal site authorized by TNPCB.

(i) Prepare and implement a Construction Waste (Spoils) Management Plan (format is given in **Appendix 3**)

- (ii) As far as possible utilize the debris, silt and excess soil in construction purpose, for example for raising the ground level or construction of access roads etc.
- (iii) Avoid stockpiling any excess spoils at the site for long time. Excess excavated soils should be disposed off to approved designated areas immediately (Kodungaiyur dumping yard and Perungudi Dump Yard of GCC are the identified dumping areas for the project).
- (iv) Surplus soil may be used as daily cover / intermediate cover at the dump site
- (v) Monitoring the quality sediment/silt generated from desilting activity for presence of hazardous substances and follow the suitable method as per the quality; hazardous material should be disposed at hazardous waste disposal facility approved by TNPCB.

141. **Air Quality**. Construction work, especially from earthwork activities, coupled with dry and windy working conditions, material and debris transport, and works along the public roads carrying significant traffic, have high potential to generate dust. Significant quantities of earthwork will be conducted spreading all over the project area. 30% of the excavated soil will be reused for filling the trenches. Also, emissions from construction vehicles, equipment, and machinery used for excavation and construction will induce impacts on the air quality. Anticipated impacts include dust and an increase in the concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons. Dust generation from construction work in individual and confined work sites like storm water pumping stations etc. will be mainly during the initial construction phase of earthwork, as the site is confined, dust can be effectively controlled with common measures. Dust generation will be significant during drain construction along the roads. An increase in dust/ particulate matter in ambient air is detrimental and may have adverse impacts on people and the environment. To mitigate the impacts, contractors will be required to:

1. For all construction works

- (i) Provide a dust screen around the construction sites of storm water pumping stations.
- (ii) Damp down the soil and any stockpiled material on-site by water sprinkling.
- (iii) Stabilize surface soils where loaders, support equipment, and vehicles will operate by using water and maintain surface soils in a stabilized condition
- (iv) Apply water before levelling or any other earth-moving activity to keep the soil moist throughout the process
- (v) Cover the soil stocked at the sites with tarpaulins
- (vi) Control access to the work area, prevent unnecessary movement of the vehicle, public trespassing into work areas; limiting soil disturbance will minimize dust generation
- (vii) Use tarpaulins to cover the loose material (soil, sand, aggregate, etc.,) when transported by open trucks.
- (viii) Control dust generation while unloading the loose material (particularly aggregate, sand, soil) at the site by sprinkling water and unloading inside the barricaded area
- (ix) Clean wheels and undercarriage of haul trucks before leaving the construction site
- (x) Ensure that all the construction equipment, machinery are fitted with pollution control devices, which are operating correctly, and have valid pollution under control (PUC) certificate

2. For all linear (drain/surplus drain) works

- (i) Barricade the construction area using hard barricades (of 2 m height) on both sides
- (ii) Initiate site clearance and excavation work only after barricading of the site is done
- (iii) Confine all the material, excavated soil, debris, equipment, machinery (excavators, cranes, etc.,), to the barricaded area
- (iv) Limit the stocking of excavated material at the site; remove the excess soil from the site immediately to the designated disposal area
- (v) Undertake the work section wise, a 500m section should be demarcated and barricaded; open up several such sections at a time, but care shall be taken to locate such sections in different zones
- (vi) Conduct work sequentially excavation, drain construction, backfilling; testing section-wise (for a minimum length as possible) so that backfilling, stabilization of soil can be done.
- (vii) Backfilled trench at any completed section after removal of barricading will be the main source of dust pollution. The traffic, pedestrian movement, and wind will generate dust from the backfilled section.

142. **Desilting and Handling of Sediment/silt**. The project requires desilting of existing drains and surplus canals to remove the accumulated bottom sediment. As the silt is mixed with the water, handling and transport of silt/sediment in semi-solid / slurry form will lead to spillage of contaminated water/slurry and may contaminated land and nearby water bodies. Although sediment does not contain hazardous substances, poor condition of existing drains with accumulated water, potentially mixed with wastewater in some places, may present hazardous conditions for removal of sediment/silt. Surplus canals are seasonal and flow only during rains, works will be certainly conducted in the dry season. Following measures are suggested to avoid environment and health impacts:

- (i) Desilting process of surplus canals shall be conducted during the no flow season only
- (ii) Prior to desilting process, the drains shall be allowed dry so that there is no standing water on silt / sediment
- (iii) Do not conduct manual desilting process, use appropriate equipment / implements
- (iv) Desilting shall be conducted in small sections, accumulated water, if any shall not be pumped out, but pumped to adjoining section within the same drain
- (v) Desilting process shall be conducted in such a way that water content of the silt/sediment is low, so that contaminated water is not spilled during the loading, transport and unloading process. The excavated sludge shall be placed temporary in dry areas / desilted portion / banks of the canal/ drain, which will allow the water content in the sludge to drain back to the canal; in no case contaminated water is allowed to flow outside the drain/canal
- (vi) Workers shall be provided with appropriate PPE's; masks with oxygen cylinders shall be made available at the site, which shall be utilised during emergency.

143. **Surface Water Quality**. Run-off from stockpiled materials and chemicals from fuels and lubricants during construction works can contaminate the water quality of the receiving water bodies and streams/rivers. There are eight major lakes (Ambattur, Kolathur, Korattur, Retteri, Madhavaram Periaythoppu (Mathur), Sadanyankuppam, Ariyalur, Kadapakkam) and Puzhal Lake (outside GCC Boundary) and 71 minor lakes in and around the project area. Surface runoff from

the project area ultimately drains into Kosasthalaiyar watershed and dispose into Ennore Creek. Runoff from the construction areas, which may contain silt and chemical traces that must not enter the river and the water bodies. The Impact will be temporary, and but needs to be mitigated. Contractor will be required to:

- (i) All earthworks are conducted during the dry season to prevent the problem of soil/silt run-off during rains
- (ii) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets;
- (iii) Prioritize the re-use of excess spoils and materials in the construction works. If spoils will be disposed off, only designated disposal areas shall be used;
- (iv) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies;
- (v) Place storage areas for fuels and lubricants away from any drainage leading to water bodies;
- (vi) Store fuel, construction chemicals, etc., on an impervious floor, also avoid spillage by careful handling; provide spill collection sets for effective spill management
- (vii) Dispose of any wastes generated by construction activities in designated sites; and
- (viii) Conduct surface quality inspection according to the Environmental Management Plan (EMP).

144. **Surface and Groundwater Quality**. Another physical impact that is often associated with excavation is the effect on drainage and the local water table if groundwater and surface water collect in the voids. State Ground and Surface Water Resources Data show that areas close to Chennai coast having ground water table below 2 to 3m during rainy season and 4 to 5m during rest of the year. In the project area, the groundwater table is deeper than the anticipated excavation depth and therefore this impact is not envisaged. However, during the rains, water will be collected in open pits and trenches. The water collected in excavated pits will contain silt and disposal of this in drainage Canals lead to silting. To avoid this the contractor needs to implement the following measures:

- (i) As far as possible control the entry of runoff from upper areas into the excavated pits, and work area by creation of temporary drains or bunds around the periphery of the work area
- (ii) Pump out the water collected in the pits/excavations to a temporary sedimentation pond; dispose off only clarified water into drainage Canals/streams after sedimentation in the temporary ponds
- (iii) Consider safety aspects related to pit collapse due to accumulation of water.

145. **Management of flood and drainage during construction works.** As per the implementation schedule the project construction period is between 24 to 36 months, during which the construction shall face minimum 2 monsoon seasons. Project area has almost flat terrain, and flood prone. Works involves repair and rehabilitation of existing 175 km drains and 11 km length of four surplus canals. The improvement works may interfere with the storm water and flood management system of the project areas, especially during the rains. Following measures shall be implemented:

(i) Contractor in coordination with GCC to plan and schedule the existing drains rehabilitation and surplus canal works duly considering the flood management aspect

- (ii) Plan existing drains rehabilitation and surplus canal works during dry season and ensure that works are complete before the onset of monsoon
- (iii) If the full works cannot be completed within one dry season (which is likely as the construction period is at least 2 years), works shall be conducted section-wise so that surplus canals and/or existing drains are put into operation prior to onset of monsoon; work sections shall be cleared of construction materials, debris and any obstructions creating for construction shall be removed
- (iv) To safeguard works and avoid flood/ water logging, the contractor will prepare a suitable site-specific temporary drainage management plan (including emergency response, clean-up kit and trained personnel, to assist with mitigating the damage) and will implement the same.

146. **Impacts on Biological Environment.** Most of the project area is characterized by urban and semi urban areas. About 2.5 percent of the area is in coastal regular zone, including. The Ennore Creek into which project area drains, joining ultimately the Bay of Bengal. Proposed drains works are mostly located along the roads, and these works are unlikely to cause any impacts on biological environment. About 60 km of drain work is located in CRZ II, which is basically already developed areas. Two pumping stations are also located in CRZ, in a vacant land along Buckingham canal. There are also some works located close to the sea CRZ IVA and IVB, but these are just fraction of total works – about 1.6 km length at various places. These are mainly to connect to the discharge point. Works in the CRZ will be implemented only after obtaining clearance from the TNSCZMA, and GCC will comply with conditions, if any laid down by TNSCZMA.

147. The construction phase will involve a series of activities that can potentially cause topsoil erosion and sedimentation, especially during the monsoon. Flooding or silt laden runoff, which may also be contaminated due to mixing of construction materials and spills, generated from construction may increase the silting and contamination of water bodies. Runoff can wash sediments into the Ennore creek and can alter the water quality. Sediments play an important role in elemental cycling in the aquatic environment, Sediment deposition creates habitats for aquatic life, and while too much sediment can be detrimental can cause poor water quality and algal blooms. Measures already provided under Surface water quality such as avoiding works during monsoon, protecting sites to avoid runoff, and management of runoff and flood during monsoon, etc. will minimize the water quality and sediment issues. Presence of workforce, materials and machinery in coastal zone, especially near the Ennore Creek, may disturb/damage the environment, flora and fauna, if due care is not taken. Following measures need to be implemented:

- (i) No works in the CRZ shall be until clearance under CRZ Notification, 2019 is obtained and complied with conditions, if any, stipulated therein.
- (ii) Implement all measures suggested to manage surface water runoff and quality during the construction works
- (iii) Where necessary, before the monsoon measures actions like, diversion ditches can be created in order to intercept and slow down the speed of runoff into the Creek; small, compacted soil berms can be created to intercept runoff and reduce erosion and sediment transport and can reduce the area of water displacement.
- (iv) Conduct monitoring of sediment and water quality in water bodies and creek as per EMP
- (v) Do not use heavy equipment on the coastal zone; use machinery to the minimum possible extent, and restrict the movement to drain/work area
- (vi) Do not place / store materials, waste or debris in the coastal zone

- (vii) Do not remove vegetation or trees
- (viii) Create awareness among the workers and staff on the coastal environment sensitivity and ensure no damage/disturbance to flora and fauna.

148. **Generation of Construction Wastes/debris.** Solid wastes generated from the construction activities are excess excavated earth (spoils), discarded construction materials, cement bags, wood, steel, oils, fuels, and other similar items. Domestic solid wastes may also be generated from the workers' camp. Improper waste management could cause odor and vermin problems, pollution and flow obstruction of nearby watercourses and could negatively impact the landscape. The following mitigation measures to minimize impacts from waste generation shall be implemented by the contractor:

- (i) Prepare and implement a Construction Waste (Spoils) Management Plan (format is given in **Appendix 3**)
- (ii) Solid wastes should be properly segregated in biodegradable and nonbiodegradable for collection and disposal to the designated solid waste disposal site; create a compost pit at designated sites for disposal of biodegradable waste; non-biodegradable waste shall be collected separately and disposed to approve designated areas.
- (iii) Residual and hazardous wastes such as oils, fuels, and lubricants shall be disposed of in disposal sites approved by TNPCB
- (iv) Prohibit burning of construction and/or domestic waste
- (v) Ensure that wastes are not haphazardly thrown in and around the project site; provide proper collection bins and create awareness to use the dust bins.
- (vi) Conduct site clearance and restoration to original condition after the completion of construction work; PIU to ensure that the site is properly restored before issuing of construction completion certificate.

149. **Noise and Vibration Levels**. The sensitive receptors are the general population in these areas. An increase in noise level may be caused by excavation, particularly breaking of cement concrete or bitumen roads for drain construction, operation of construction equipment, and the transportation of equipment, materials, and people. Vibration generated from construction activity, for instance from the use of pneumatic drills, will have an impact on nearby buildings. This impact is negative short-term, and reversible by mitigation measures. The construction contractor will be required to:

- (i) Plan activities in consultation with PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in the least disturbance
- (ii) Minimize the noise from construction equipment by using vehicle silencers, fitting jackhammers with noise-reducing mufflers, and use portable street barriers to minimise sound impact to surrounding sensitive receptor; and
- (iii) Maintain maximum sound levels not exceeding 80 decibels (dB (A)) when measured at a distance of 10 m or more from the vehicles.
- (iv) Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity
- (v) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach
- (vi) Consult local communities in advance of the work to identify and address key issues, and avoid working at sensitive times, such as religious and cultural festivals.

150. **Accessibility and Traffic Disruptions**. Excavation along the roads for drain construction, hauling of construction materials and operation of equipment on-site will cause traffic problems. There are four types of roads in the project area that provide regional connectivity viz National Highway (NH), State Highway (SH), Major District Roads (MDR) and Other District Roads (ODR). Drains are proposed along:

- (i) NH 5 Chennai Kolkata Highway
- (ii) NH 716 Chennai Tirupathi Highway
- (iii) SH 56 Thiruvottiyur Ponneri State Highways
- (iv) Inner Ring Road (IRR),
- (v) Chennai bypass road.

151. National Highway and State Highways carry considerable traffic, followed by other roads. Drains will also be constructed along the internal main roads that provide connectivity within the city. These include Thiruvottiyur high road, Manali high road, Madhavaram high road, Ennore high road, etc., these roads also carry a considerable flow of traffic and are centres of commercial activities. Internal roads in the project area are narrow, and in outer areas roads are comparatively wide. As the drains are proposed to be constructed within the road carriageway, it will disrupt traffic in one-lane. Works related to all the remaining components (storm water pumping stations) will be confined to the selected sites, therefore there is no direct interference of these works with the traffic and accessibility.

152. Hauling of construction material, equipment, construction waste, etc., to and from the work site may increase the road traffic on local roads. This will further inconvenience the local community and road users. The potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

1. Drain Construction

- (i) Prepare a traffic management plan for drains works along the roads
- (ii) Provide safe and clearly marked lanes for guiding road users.
- (iii) Provide safe and clearly marked buffer and work zones
- (iv) Provide adequate measures that control driver behaviour through construction zones.
- (v) The primary traffic control devices used in work zones shall include signs, delineators, barricades, cones, pylons, pavement markings and flashing lights.
- (vi) Advance traffic updates/ information on communication systems for users of affected roads.
- (vii) Efforts will be given to divert traffic to roads wide enough to accommodate extra traffic
- (viii) Prepare a drain construction implementation plan in each zone separately and undertake the work accordingly; ensure that for each road where the work is being undertaken there is an alternative road for the traffic diversion; take up the work in a sequential way so that public inconvenience is minimal
- (ix) Plan the drain work in coordination with the traffic police; provide temporary diversions, where necessary and effectively communicate with the general public

- (x) Avoid construction work in all roads in a colony at one go; it will render all roads unusable due to excavations at the same time, creating large scale inconvenience
- (xi) Undertake the work section wise, a 500 m section should be demarcated and barricaded; open up several such sections at a time, but care shall be taken to locate such sections in different zones
- (xii) Confine work areas in the road carriageway to the minimum possible extent; all the activities, including material and waste/surplus soil stocking should be confined to this area. Proper barricading should be provided; avoid material/surplus soil stocking in congested areas immediately removed from the site/ or brought to the as and when required
- (xiii) Limit the width of trench excavation as much as possible by adopting best construction practices; adopt vertical cutting approach with proper shoring and bracing; this is especially to be practiced in narrow roads and deeper sewers; if they deep trenches are excavated with slopes, the roads may render completely unusable during the construction period
- (xiv) Leave spaces for access between mounds of soil to maintain access to the houses/properties; access to any house or property shall not be blocked completely; alternative arrangements, at least to maintain pedestrian access at all times to be provided
- (xv) Provide pedestrian access in all the locations; provide wooden/metal planks over the open trenches at each house to maintain the access.
- (xvi) Inform the local population 1-week in advance about the work schedule
- (xvii) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum.
- (xviii) Keep the site free from all unnecessary obstructions;
- (xix) Warn the road user clearly and sufficiently in advance. Notify affected public by public information notices, providing signboards informing nature and duration of construction works and contact numbers for concerns/complaints. Provide information to the public through media newspapers and local cable television (TV) services
- (xx) At work site, public information/caution boards shall be provided including contact for public complaints.

2. Hauling (material, waste/debris, and equipment) activities

- (i) Plan transportation routes so that heavy vehicles do not use narrow local roads, except near delivery sites
- (ii) Schedule transport and hauling activities during non-peak hours;
- (iii) Locate entry and exit points in areas where there is low potential for traffic congestion;
- (iv) Drive vehicles in a considerate manner
- (v) Notify affected public by public information notices, providing signboards informing nature and duration of construction works and contact numbers for concerns/complaints.

153. **Socio-Economic – Income.** Sites for Storm water Pumping Station (SWPS) components are carefully selected in government-owned vacant lands and therefore there is no requirement for land acquisition or any resettlement. Blocking of access to the business/livelihood activities, especially during drain construction along the roads, may impact the income of households. However, given the alignment of drain within the road carriageway, and also the measures

suggested for ensuring accessibility during drain construction, no notable impact is envisaged. Some shops and other premises along the roads may lose business income if the access will be impeded by the excavation of trenches, the presence of heavy vehicles and machinery, etc. Access disruption to hospitals, socio-cultural places, etc., will cause inconvenience to the public. Implementation of the following best construction measures will avoid the disturbance to reduce the inconvenience and disturbance to the public. Resettlement and social issues are being studied in a parallel resettlement planning study of this project.

- (i) Inform all businesses and residents about the nature and duration of any work well in advance so that they can make necessary preparations;
- (ii) Do not block any access; leave spaces for access between barricades/mounds of excavated soil and other stored materials and machinery, and providing footbridges so that people can crossover open trenches
- (iii) Barricade the construction area and regulate the movement of people and vehicles in the vicinity, and maintain the surroundings safely with proper direction boards, lighting and security personnel – people should feel safe to move around
- (iv) Control dust generation
- (v) Employee best construction practices, speed up construction work with better equipment, increase the workforce, etc., in the areas with predominantly commercial, and with sensitive features like hospitals, and schools;
- (vi) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and
- (vii) Provide signboards for pedestrians to inform the nature and duration of construction works and contact numbers for concerns/complaints.

154. **Socio-Economic – Employment**. Manpower will be required during the 36-months construction stage. This can result in the generation of temporary employment and an increase in local revenue. Thus, potential impact is positive and short-term. The Contractor will be required to:

- (i) Employ local labour force as far as possible
- (ii) Comply with labour laws.

155. **Occupational Health and Safety**. It is estimated to have 250 construction labours/ workers. Workers need to be mindful of the occupational hazards which can arise from working in confined areas such as trenches, working at heights, near the heavy equipment operating areas, etc. Potential impacts are negative and short-term but reversible by adopting suitable mitigation measures. The Contractor will be required to:

- (i) Follow all national, state and local labour laws (an indicative list is given in **Appendix 2**);
- Develop and implement site-specific occupational health and safety (OHS) Plan which shall include measures such as: (a) safe and documented construction procedures to be followed for all site activities; (b) ensuring all workers are provided with and use personal protective equipment; (c) OHS Training⁸ for all site

⁸ Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective and the worker is competent at their job. The level of supervision and

personnel, (d) excluding public from the work sites; and (e) documentation of workrelated accidents; Follow International Standards such as the World Bank Group's Environment, Health, and Safety Guidelines⁹.

- (iii) Ensure that qualified first-aid personnel/specialist is available at all times in the project site. Equipped first-aid stations shall be easily accessible throughout the sites
- (iv) Secure all installations from unauthorized intrusion and accident risks
- (v) Provide H and S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers
- (vi) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted
- (vii) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas
- (viii) Ensure moving equipment is outfitted with audible back-up alarms
- (ix) Mark and provide signboards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be following international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate
- (x) Disallow worker exposure to noise level greater than 85 dBA for more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.
- (xi) Provide supplies of potable drinking water
- (xii) Provide clean eating areas where workers are not exposed to hazardous or noxious substances
- (xiii) COVID-19. WHO has declared COVID-19 as a pandemic which has affected entire world including India. In view of the prevailing COVID-19 pandemic, the contractors and workers would need to take additional measures to avoid the spread of the disease and shall follow various guidelines/guidance notes issued by the national/state government, WHO, ILO, World Bank/IFC from time to time. As described in these guidelines, the Contractors shall undertake a COVID risk assessment of project area and prepare a COVID Response and Management Plan (C-R&MP) and submit to GCC and PSC for approval. A brief guidance on "To Do" List prepared from these documents is provided in **Appendix 14**.

156. **Community Health and Safety**. Drain construction along the roads and narrow streets and hauling of equipment and vehicles have the potential to create safety risks to the community. Trench excavations without any proper protection may endanger the close-by buildings. Hazards posed to the public, specifically in high-pedestrian areas may include traffic accidents and vehicle collisions with pedestrians. The potential impact is negative but short-term and reversible by mitigation measures. The contractor will be required to:

(i) Confine work areas; prevent public access to all areas where construction works are on-going through the use of barricading and security personnel

monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

⁹http://www.ifc.org/wps/wcm/connect/a99ab8804365b27aa60fb6d3e9bda932/EHS-Guidelines+101-Webinar.pdf?MOD=AJPERES

- (ii) Attach warning signs, blinkers to the barricading to caution the public about the hazards associated with the works, and presence of deep excavation
- (iii) Minimize the duration of time when the drain trench is left open through careful planning; plan the work properly from excavation to refilling and road relaying
- (iv) Control dust pollution implement dust control measures as suggested under air quality section
- (v) Ensure appropriate and safe passage for pedestrians along with the work sites
- (vi) Provide road signs and flag persons to warn of on-going trenching activities.
- (vii) Restrict construction vehicle movements to defined access roads and demarcated working areas (unless in the event of an emergency)
- (viii) Enforce strict speed limit (20 kmph) for plying on unpaved roads, construction tracks
- (ix) Provide temporary traffic control (e.g., flagmen) and signs where necessary to improve safety and smooth traffic flow
- (x) Where traffic is diverted around crossings, traffic control or careful selection of the exit from the working areas will be provided to ensure that vehicles join the road in a safe manner.
- (xi) At sensitive locations particularly where there are schools and markets close to the road, awareness of safety issues will be raised through neighbourhood awareness meetings
- (xii) All drivers and equipment operators will undergo safety training
- (xiii) Maintain regularly the construction equipment and vehicles; use manufacturerapproved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.

157. **Safety Requirements for Deep Trench works**. Deep trench works should be carried out as per the instructions received from the PSC. The following safety mitigation measures should be adopted:

- (i) Sides of excavation shall be inspected by PSC during the course of excavation from time to time and after every rain, storm or other hazard-increasing occurrence and protection against slides and cavings shall be increased, if necessary
- (ii) Complete information on the underground structures (such as water pipelines, sewers, gas mains, electrical conduit system and other civic facilities) should be collected before doing the excavation work. Proper precautions shall be taken to prevent accident to the workmen engaged in excavation work and calamities for the general public
- (iii) Where medical facilities (including hospitals) are not available nearby, first-aid kit should be available. This shall be kept at a conspicuous place in the charge of trained person(s). The kit shall be recouped periodically.
- (iv) Labors shall be instructed to use safety devices and appliances provided to them whenever it is necessary to do so
- (v) Labors who are not aware of the hazards peculiar to the work shall not be permitted to proceed with the work without being properly instructed.
- (vi) Safety helmets shall be worn by all persons entering trench where hazards from falling stones, timber or other materials exist
- (vii) Appropriate safety footwear (rubber boots, protective covers, etc.,) shall be worn by labours who are engaged in work requiring such protection
- (viii) All trenches in soil more than 1.5 m deep shall be securely shored and timbered.
- (ix) All trenches in friable or unstable rock exceeding 2 m in depth shall be securely shored and timbered

- (x) Where the sides of trenches are sloped but not to within 1.5 m of the bottom, the vertical sides shall be shored and the shoring shall extend at least 30 cm above the vertical sides. When open spaced sheathing is used, a toe board shall be provided to prevent material rolling down the slope and falling into the part of the trench with vertical walls.
- (xi) Shoring and timbering shall be carried along with the opening of a trench but when conditions permit, protection work, such as sheet piling may be done before the excavation commences.
- (xii) Approved quality of sal wood shall be used for shoring and timbering a trench. Any other structural material having strength not less than that of sal wood may also be used for the purpose.

158. **Construction Camps.** The contractor may require to set up construction camps – for the temporary storage of construction material (cement, aggregates, steel, fixtures, fuel, lubricants, etc.,), and stocking of surplus soil, and may also include separate living areas for migrant workers. The contractor will, however, be encouraged to engage local workers as much as possible. Operation of work camps can cause temporary air, noise and water pollution, and may become a source of conflicts, and the unhealthy environment if not operated properly. Potential impacts are negative but short-term and reversible by mitigation measures. The contractor will be required to:

- (i) Consult PIU before locating project offices, sheds, and construction plants;
- (ii) Select a campsite away from residential areas (at least 100 m buffer shall be maintained) or locate the campsite within the existing facilities of GCC offices
- (iii) Avoid tree cutting for setting up camp facilities
- (iv) Provide a proper fencing/compound wall for campsites
- (v) The campsite shall not be located near (100 m) water bodies, flood plains floodprone/low lying areas, or any ecologically, socially, archeologically sensitive areas
- (vi) Separate the workers living areas and material storage areas clearly with a fencing and separate entry and exit
- (vii) Ensure conditions of liveability at work camps are maintained at the highest standards possible at all times; living quarters and construction camps shall be provided with standard materials (as far as possible to use portable ready to fit-in reusable cabins with proper ventilation); thatched huts, and facilities constructed with materials like GI sheets, tarpaulins, etc., shall not be used as accommodation for workers
- (viii) Camps shall be provided with proper drainage, there shall not be any water accumulation
- (ix) Provide drinking water, water for other uses, and sanitation facilities for employees
- (x) Prohibit employees from cutting of trees for firewood; the contractor should provide cooking fuel (cooking gas); firewood is not allowed
- (xi) Train employees in the storage and handling of materials which can potentially cause soil contamination
- (xii) Wastewater from the camps shall be disposed of properly either into the sewer system; if the sewer system is not available, provide on-site sanitation with a septic tank and soak pit arrangements
- (xiii) Recover used oil and lubricants and reuse or remove from the site;
- (xiv) Manage solid waste according to the following preference hierarchy: reuse, recycling, and disposal to designated areas; provide a compost pit for biodegradable waste, and non-biodegradable / recyclable waste shall be collected and sold in the local market

- (xv) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
- (xvi) On completion of works, the camp area shall be cleaned and restored to preproject conditions and submit a report to PIU; PIU to review and approve camp clearance and closure of worksite.

C. Operation and Maintenance Impacts

159. Operation and Maintenance (O&M) of the storm water drainage system during defect liability period (DLP) and after DLP will be carried out by Contractor and GCC respectively. Operation impacts of storm water drains include:

- (i) Contamination of storm water due to the mixing of sewage or industrial wastewater
- (ii) Clogging of drains due to deposition of eroded soil, improper cleaning.

160. **Contamination of storm water due to the mixing of sewage or industrial wastewater:** To enhance the drain water quality, it is necessary to divert/avoid the sewage water entering into the drains. The proposed storm water drain is designed to prevent the entry of sewage or industrial wastewater. However, in some area though UGSS exists, individual house connections are yet to be provided, for those cases, there are possibilities in which the proposed storm water drain may be used. Hence, GCC should have an appropriate mechanism in monitoring and controlling the same. GCC should take necessary measures to avoid the sullage/sewage intrusion into the drain by implementing house service connection to all households within the project area. However, during the construction of storm water drains, to avoid spilling of sullage/sewage, rider sewers or diversion of an existing connection to nearby manholes are proposed. The contractor and GCC needs to check the water quality monitoring at regular intervals as prescribed in the Environmental Monitoring Program.

161. **Regular maintenance**: To enhance the drain water quality, regular maintenance should be considered by de-silting the drain prior to monsoon, clearing of vegetation along the drain, immediate repairing of damaged structures and conducting awareness programs to the people residing next to project drains.

162. **Clogging of drains due to deposition of eroded soil, improper cleaning:** Storm drains become clogged by deposition of silt and sand that form pools in which debris and other solid materials accumulate. Storm drains are sometimes misused as a receptacle for rubbish, waste building materials, ashes and other solid wastes deposited in them through inspection door or unauthorized openings. To avoid solid waste dumping into the stormwater, drain, the major and micro drains are designed as box type drain in RCC with a cover on top and inspection door at every 10 m interval to remove the accumulated silt/debris. In closed drains, super sucker machines are used to remove the accumulated silt/ debris. Major surplus canals where open drains exist with retailing wall, machineries such as amphibian vehicle and robotic excavators are used to remove the accumulated silt/debris.

163. Micro drains will be constructed as box type drain in RCC with a cover on top which will curtail dumping of solid waste in drains. Major macro drains belonging to Greater Chennai Corporation will be constructed as open drains with both side cover in MS frame with wire mesh to avoid dumping of solid waste.

164. **Solid waste management.** At present, GCC is having an effective solid waste management system. However, the people living nearer to water bodies and the commercial

pockets that exist near Water bodies are tending to throw solid waste into the water bodies. Therefore, the following practices are proposed in the SWD of the Kosasthalaiyar Basin.

- (i) Major and Micro drains are designed as box type drain in RCC with a cover on top which will prevent dumping of solid waste in drains.
- (ii) Major surplus canals where open drains exist with retailing wall, fencing on both sides of the canal is proposed to avoid solid waste disposal.
- (iii) Major surplus canals where open drains exist without retailing wall, retaining wall and fencing on both sides of the canal is proposed to avoid solid waste disposal.
- (iv) Rainwater will flow into drains through FRP gratings to screen the solid waste from entering into drains.
- (v) Public awareness programs have been proposed to ensure public co-operation for proper waste disposal.

165. **Disaster management and Emergency Response.** The study area is a coastal city, and is vulnerable to various disasters, and most profound is water logging and flooding during rains. GCC has prepared a Disaster Management Plan in 2017 to assist and guide all the stakeholders in disaster management. The plan follows the approaches suggested in Sendai Framework for Disaster Risk Reduction, 2015-2030. Plan covers 28 disasters grouped in 5 subgroups including both natural and manmade disasters. Disaster management systems at Chennai district level includes District Disaster Management Committee, Disaster Management Teams, Crisis Management Groups, Emergency Operation Centre, Site Operation Centres, and modalities of involvement of army and other defense forces, NGOs and other institutions. Pre monsoon preparedness activities are conducted at various levels, and Indian Mereological Department rain, flood and cyclone warnings are integrated into the system. Control rooms established to monitor the activities, especially during monsoon. Overall, a robust disaster management system exists in Chennai. Under Output 2 of this project, it is also proposed to further enhance capacity of GCC and communities in urban flood preparedness in the project area.

D. Associated Facilities

166. As stated earlier, three macro drains / surplus canals in the project area are proposed to be improved by PWD either with state funds or with external financial support. These drains are: Retteri Surplus (2.01 km), Puzhal Surplus (12.23 km) and Thanikachalam Drain (3.62 km). PWD has already the DPR has been prepared. As per the SPS "associated facilities" are those that are not funded as part of the project (funding may be provided separately by the borrower/client or by third parties), and whose viability and existence depend exclusively on the project and whose goods or services are essential for successful operation of the project". These surplus canals already exist and proposed improvements although required, may not be essential for the viability of the ADB project. Therefore, these are not considered as associated facilities.

167. The improvement works proposed by PWD for improvement of surplus canals is similar to improvements proposed for surplus canals under the ADB funded IUFMCKB Project. The project sites are also located in the same project area – Chennai – Kosathalaiyar River basin. In terms of compliance with government laws and regulations, works proposed by PWD does not attract EIA Notification, 2006, and therefore, will not require an EIA study or environmental clearance. As per the CRZ notification 2019, some of the proposed works fall under the coastal regulation zone (CRZ). A section of the existing Puzhal surplus canal is traversing through CRZ 1B. Hence any improvement in that section shall attract CRZ clearance. It also has few storm water discharge locations within the CRZ 1B. For the works located in the CRZ, prior clearance/no objection from the Tamil Nadu State Coastal Zone Management Authority (TNSCZMA) is required.

VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Overview

168. The active participation of stakeholders including the local community, NGOs, etc., in all stages of project preparation and implementation, is essential for the successful implementation of the project. It will ensure that the subprojects are designed, constructed, and operated with utmost consideration to local needs, ensures community acceptance, and will bring maximum benefits to the people. Public consultation and information disclosure is a must as per the ADB policy.

169. Most of the main stakeholders have already been identified and consulted during the preparation of this IEE, and any others that are identified during the project implementation will be brought into the process in the future. Primary stakeholders of the subproject are the residents, owners/ tenants of the commercial establishments who live and work near sites where facilities will be built (stormwater drain network and pumping stations), government and utility agencies responsible for the provision of various services in the project area. Secondary stakeholders are the NGOs working in the area, community representatives, the beneficiary community in general, government agencies, TNSCZMA, Government of Tamil Nadu.

170. The public consultation and disclosure program is a continuous process throughout the project implementation, including project planning, design, and construction. The project proposal is formulated by Greater Chennai Corporation in consultation with the public representatives in the project area to suit their requirements.

B. Stakeholders Consultation during Project Preparation

171. Stakeholders were consulted via a city-level consultation meeting and a several focus ground discussions during the project preparation to disseminate project information and also to elicit the feedback. Details of these consultation meetings are provided below:

1. City-level Stakeholder Consultation Meeting

172. The stakeholder consultation meeting was held on 06.11.2017 at conference hall of Greater Chennai Corporation. It was attended by all relevant officials from GCC, PWD, CMWSSB, TNEB & TNUIFSL, NGO's, Members from various associations, Residents & General public from relevant zones. Details of Participants and the minutes of the meeting are given **Appendix 8**.

173. The meeting was chaired by the Dr.D. Karthikeyan I.A.S., Commissioner, Greater Chennai Corporation and welcome note was given by Superintending Engineer (SWD) GCC. The presentation started with the DPR consultant elaborating the details of the drains and alignments. The DPR consultant explained the project background, present and future scenario of the project, general arrangement of proposed canals and improvement proposal for the water bodies with relevant photographs and animations. The consultant described water logging areas and the narrow stretches of the outlets and inlets in various locations of the project area. Various benefits like flood management, ground water recharging, reduction in water logging, removal of encroachments, etc. were put forth in the meeting.



Dr. Karthikeyan I.A.S., Commissioner, Greater Chennai Corporation chairing the session.



DPR consultants explaining the project

174. After the PowerPoint presentation, the Commissioner, Greater Chennai Corporation invited the stakeholders to give their suggestions and comments on the project. Feedback forms were distributed to the audience of the meeting to give their suggestions and comments on the project. Majority of stakeholders appreciated the project. The format of feedback form formulated in a view to provide full freedom for the stakeholders to register their comments/suggestions. The feedback forms collected from stakeholders and are given in the **Appendix 8**. The details of the queries raised by the stakeholder and the replies are given in below.

SI. No	Queries raised by Arropor lyakkam (NGO)	Response by Superintending Engineer (SE)
1.	Construction of the Drains should be provided to carry the capacity of the Storm Water during rainy seasons	The drains were designed scientifically based on the past 46 year's rainfall data. The capacity of the drains shall carry the water during rainy days.
2.	RCC drains shall be replaced by brick wall drains and with earthen base so that the water will percolate inside the ground.	RCC drains were selected based on the standards approved by Ministry of urban planning and the same has been used for ISWD drains of Adyar and Cooum basin. There will be provision of sunken wells and kerb and gutters provisions once in 30 mts along the drains to ensure, ground water percolations.
3.	Prevention of illegal sewer into storm water drains.	Illegal sewers will be prevented, once the CMWSSB covers certain areas with underground drainage, individual household connections are still not made in certain places. Once the work is completed, illegal sewer will not be allowed to let into storm water drains.
4.	If any encroachments found along the narrowed sections/mouth of the canals will be removed.	If any encroachments found along the narrow junction of outlet and mouth of drains will be removed and the affected families will be mitigated as per ADB guidelines.
5.	Whether the design considers the invert levels of the area.	Detailed studies were conducted, and modelling exercises were carried out by the DPR consultants to ensure flow and invert levels of the drains and the MFL bed levels and drain levels of water bodies.

(i) Queries raised by Arropor lyakkam (NGO)

(ii) Query raised by Uravagal (NGO)

SI. No.	Queries raised by Uravagal (NGO)	Response by DPR Consultant
1.	How the displaced people will be mitigated.	The Social Safeguard Specialist of DPR consultant explained that the displaced and project affected families will be mitigated as per ADB policy framework.

(iii) Query rose by 4M trust (NGO)

SI. No.	Queries raised by 4M trust (NGO)	Response by DPR Consultant
1.	How the displaced people will be provided alternate houses and mitigated?	The Social Safeguard Specialist of DPR consultant explained that the project affected families and displaced families shall be resettled, rehabilitated and mitigated as per ADB policy framework.

(iv) Queries raised by consulting firms

SI. No.	Queries raised by Consulting firms	Response by DPR Consultant				
1	What arrangements will be made for removal of trees along the drains	The Environmental Specialist of the DPR Consultant explained that for trees identified along the drains, detouring plans will be suggested and if any tree identified for felling, compensatory tree plantation will be made at the rate of 1: 10.				

(v) Queries raised by Public SI. No. Queries raised by Public **Response by DPR Consultant** 1 What arrangements will be made to For the Kargil area and other similar surrounding avoid water logging problem in Kargil places, the design team has proposed for a storm nagar areas? water pumping stations at few locations to avoid water logging. 2 Whether the DPR will consider providing The DPR Consultant explained that all water logging areas were identified and studied along with solutions to water logging areas? the Flood study made by Anna University and incorporated in the design to prevent areas from water logging during rainy season and flood time. 3 Whether people will be removed from The Social Safeguard Specialist of DPR consultant existing houses without prior intimation explained that the project affected families and displaced families shall be resettled, rehabilitated and mitigated as per ADB policy framework with prior intimation.

175. The meeting was concluded with final note from the Commissioner, GCC to proceed further for the preparation of Final DPR incorporating all feasible and viable comments given by various stakeholders presented in the meeting. The Superintending Engineer presented the Vote of Thanks and the meeting winded up with positive perception of the stakeholders.

2. Focus Group Discussions

176. Focus-group discussions (FGDs) with affected persons and other stakeholders were conducted to learn their views and concerns.

177. A number of FGDs were conducted in November and December 2020 in the project, details of which are provided below. It was observed that people are willing to extend their cooperation, as the proposed project will provide storm water drainage system, enhance basic infrastructure service levels and overall living standards of the public. The public expressed their concern regarding the safety, traffic issues, disturbance utilities during construction. Stakeholders suggested that damaged roads if any due to drain construction will be restored immediately to minimize the public inconvenience. The majority of the stakeholders appreciated the project and requested to complete the construction within a short period. Details of the FGDs are given in the **Appendix 15.** Further consultations were hampered by the ongoing coronavirus (COVID-19) pandemic and as such additional formal consultations will be undertaken once it is safe to do so and before construction commences.

	Dhasa	Dete	Location of FGD		articip	oants	;
51.NO	Phase	Date			М	F	0
1	1	01-11-2020	Sivaprakasam Nagar, Surapattu	26	20	6	-
2		07-11-2020	Sivaprakasam nagar South, Surapattu	12	8	4	-
3		08-11-2020	Arul Nagar, Surapattu	27	21	6	-
4	2	08-11-2020	Vijayalakshmipuram, Ambattur	10	6	4	-
5		18-11-2020	Rajaji Nagar, Surapattu	10	-	-	10
6		18-12-2020	Ondikuppam, Kaladipet	21	6	15	-
7	3	20-12-2020	Annai Sivagami Nagar, Ennore	21	14	7	-
8		20-12-2020	TKP, Nagar, Ernavur	16	0	16	-
9		26-12-2020	Velayudham Nagar, Tiruvottiyur	16	12	4	-



178. Future Consultations. Consultations and information disclosure will be continued throughout the implementation. Prior to the start of construction, PIU will conduct information dissemination sessions at various places and solicit the help of the local community, leaders/prominent for the project work. Focus group meetings will be conducted to discuss and plan construction work with local communities to reduce disturbance and other impacts and also regarding the project grievance redress mechanism. Project information and construction schedule will be provided to the public via mass media (newspapers, GCC websites, etc.). Constant communication will be established with the affected communities to redress the environmental issues likely to face during the construction phase. Neighborhood level meetings will be organized at important/sensitive locations as required to consult the people and receive their feedback on EMP implementation. Given the current COVID19 pandemic situation, consultations will strictly follow COVID19 appropriate procedures with all safety measures prevailing at the time. Large community group meetings will not be conducted. Consultation via virtual modes will be employed. The contractor will provide prior public information (in Tamil and English) about the construction work in the area, once in 7 days before the start of work and again a day before the start of work via pamphlets (a sample public information template is provided in Appendix 4). At the worksites, public information boards will also be provided to disseminate project related information.

C. Information Disclosure

179. An executive summary of the IEE will be translated in Tamil and made available at the offices of PMU, PIU and also displayed on their notice boards. Hard copies of the IEE will be accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. An electronic version of the IEE in English and Executive Summary in Tamil will be placed on the official website of the Greater Chennai Corporation after approval of the IEE by ADB. Stakeholders will also be made aware of the grievance register and redress mechanism. IEE will also be disclosed on ADB website. Information disclosure will continue throughout project implementation. Semi-annual Environmental Monitoring Reports (SEMR) will be posted on ADB and GCC websites for public disclosure.

180. Public information campaigns to explain the project details to a wider population will be conducted. Public disclosure meetings will be conducted at key project stages to inform the public of progress and plans. Prior to the start of construction, the PIU will issue Notification on the start date of implementation in local newspapers. A board showing the details of the project will be displayed at the construction sites for the information of the general public.

181. Local communities will be continuously consulted regarding the location of construction camps, access and hauling routes and other likely disturbances during construction as required. The road closure together with the proposed detours will be communicated via advertising, pamphlets, radio broadcasts, road signage, etc.

VIII. GRIEVANCE REDRESS MECHANISM

A. Common Grievance Redress Mechanism

182. Project Grievance redressal Mechanism (GRM) will be established at three levels and will cover both environment and social issues. The GRM will be established to evaluate, and facilitate the resolution of affected persons concerns, complaints, and grievances related to social and environmental issues related to the project in a time bound manner. GRM will be accessible, inclusive, gender-sensitive and culturally appropriate for receiving and facilitating the resolution of affected persons' grievances related to the project.

183. The GRM will be disclosed to the affected communities and households prior to the mobilization of contractors for the project. The PIU safeguard officers will be responsible for registration of grievances, disclosure and communication and timely resolution of grievances. A complaint register will be maintained at field unit and PIU level with details of complaint lodged, date of personal hearing, action taken, and date of communication sent to complainant. Contact details and the process of grievance redressal will be disclosed to the project affected communities through leaflets. Sample grievance registration form is given in the **Appendix 5**.

184. Affected persons will have the flexibility of conveying grievances/suggestions by submitting the grievance/suggestion in writing, through telephone call to Executive Engineer, PIU safeguards officer or by writing in the complaints register at the Division Office or by submitting grievance/suggestion by email to GCC.

B. Grievance Redressal Process

185. In case of grievances that are immediate and urgent in the perception of the complainant, the Executive Engineer on-site will provide the most easily accessible or first level of contact for quick resolution of grievances. Contact phone numbers and names of the concerned Executive Engineer, PIU safeguard officers and contractors will be displayed at all construction sites at visible locations. The second level will be a four-member committee with the Superintending Engineer (SWD), GCC acting as its convenor. Third level will be the appellate level with the Chief Engineer (General) and Deputy Commissioner (Works).

- (i) 1st Level Grievance. The phone number of the site in charge Executive Engineer should be made available at the construction site signboards. The contractors and field unit staff can immediately resolve grievances onsite and seek the advice of the Executive Engineer as required and resolve grievances within seven days of receipt of a complaint/grievance.
- (ii) 2nd Level Grievance. All grievances that cannot be redressed within seven days at field level will be reviewed by the GRC at PIU level comprising of 4-members, with preferably one member being a woman. The committee will have any one elected member of the legislature, concerned zonal officer, a person of repute and standing in locality, nominated by the Commissioner, GCC and the Superintending Engineer (SWD) acting as its convenor.
- (iii) **3rd Level Grievance.** All grievances that cannot be redressed within 15 days at PIU level, will be placed before the Chief Engineer (General), who will consult the Deputy Commissioner (Works) in grievance resolution.



Figure 28: Grievance Redressal Mechanism Process

186. **Court of Law**: Despite the project GRM, an aggrieved person shall have access to the country's legal system at any stage and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

187. **ADB Accountability Mechanism**: In the event that the established GRM is not in a position to resolve the issue, the affected person also can use the ADB Accountability Mechanism through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB headquarters or the ADB India Resident Mission (INRM). The complaint can be submitted in any of the official languages of ADB's developing member countries.

IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management Plan

188. An Environmental Management Plan (EMP) has been developed to provide mitigation measures to reduce negative impacts to acceptable levels.

189. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between PMU, PIU, PSC, and contractors. The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on-site; (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (iv) ensure that safety recommendations are complied with. The EMP includes a monitoring program to measure the environmental condition and effectiveness of the implementation of the mitigation measures. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries.

190. The Contractor will be required to submit to PIU, for review and approval, a Site Environmental Management Plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, laydown areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program as per SEMP. No works are allowed to commence prior to the approval of SEMP.

191. The Contractors shall undertake a COVID risk assessment of project area and prepare a COVID Response and Management Plan (C-R&MP) and submit to GCC and PSC for approval. A brief guidance on "To Do" List prepared from these documents is provided in **Appendix 14**.

192. A copy of the EMP/approved SEMP will be kept on-site during the construction period at all times. The EMP included in the bid and contract documents. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

193. For civil works, the contractor will be required to (i) carry out all of the mitigation and monitoring measures outlined in the approved SEMP; and (ii) implement any corrective or preventive actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of the SEMP. The contractor shall allocate budget for compliance with these SEMP measures, requirements, and actions.

194. The potential environmental impacts, proposed mitigation measures, and responsible agencies for implementation and monitoring are furnished in the following Tables.

Activity	Anticipated	Mitigation Measures	Responsibility	Monitoring
	Impact		of Mitigation	and cost for
	Provention of	Micro drains are designed to handle the maximum rainfall of 70mm/hour	ססת	Column Project Cost
Storm Water	flooding	for 2 years return period. Macro drains and surplus capals connecting	Consultant /	Project Cost
Drain	nooding	all major lakes are designed to handle the maximum rainfall of	PILI	
Diam		106mm/hour for 5 years return period	110	
	Groundwater	Silt catch pits with rainwater harvesting structure will be constructed	DPR	Project Cost
	recharge	along the drains at every 30 m interval.	Consultant /	
			PIU	
	Sediment Control	For control of sediments, it is proposed to construct a silt catch pit at	DPR	Project Cost
		10m interval so that the sediments are deposited in the silt catch pit and	Consultant /	
	-	settle over there, which can be removed periodically.	PIU	
	Prevention of solid	i. Micro drains will be constructed as box type drain in RCC with	DPR	Project Cost
	waste into drains	a cover slab on top which will curtail dumping of solid waste in the drains	Consultant / IU	
		ii Major drains belonging to Greater Chennai Corporation are		
		open canals and will be provided with chain link fencing side		
		cover in MS frame with wire mesh to prevent dumping solid		
		waste.		
	Safety in	Inspection doors will be provided at an interval of 10m to facilitate	DPR	Project Cost
	maintenance	maintenance activities only by machineries.	Consultant /	-
			PIU	
	Traffic Loads and	Micro drains shall be constructed as box type drain in RCC with a cover	Design	Project Cost
	People access in	slab on top which can also take traffic loads due to vehicular	Consultant /	
	micro drains	movements.	PIU	
	Tree cutting	i. Minimize removal of trees by adopting to site condition and with	DPR	Project Cost
		appropriate alignment	Consultant /	
		ii. Obtain prior permission for tree cutting	PIU	
Storm Water	Noise	I. Procure good quality latest technology high pressure pumps		Project Cost
Pumping		that guarantee controlled noise at a level of around 80 dB(A) at	Consultant /	
Station		a distance of 1 m	PIU	
		II. Use acoustic enclosures – manufacturer specified for all		
		juin puttips, motors		
		and low noise fitted with acoustic enclosures		
		iv. Provide sound mufflers for ventilators in the plant rooms and		
		soundproof doors		
		v. Provide earplugs to workers		

 Table 42: Design Stage Environmental Impacts and Mitigation Measures

Activity	Anticipated Impact		Mitigation Measures	Responsibility of Mitigation	Monitoring and cost for column
	Energy Consumption	i.	Using low-noise and energy-efficient pumping systems	DPR Consultant / PIU	Project Cost

Field	Anticipated Impact		Mitigation Measures	Implementing agency	Monitoring Responsibility	Cost and Source of
Submission of updated EMP / SEMP; EMP implementation and reporting	Unsatisfactory compliance with EMP	i. ii. ii.	Appoint EHS Supervisor to ensure EMP implementation Submission of updated EMP/ SEMP prior to starting of work, Timely submission of monthly monitoring reports including documentary evidence on EMP implementation such as photographs SEMP documents shall include information about tree cutting, construction of labour camps, storage areas, hauling roads, regulatory permissions, disposal areas for solid and hazardous wastes, sensitive features like schools and hospitals	Contractor	PSC/PIU	Contractor costs
Utilities	Telephone lines, electric poles, and wires, water lines within the proposed project area	i. iii. iv.	Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during the construction phase; and Require contractors to prepare a contingency plan to include actions to be taken in case of unintentional interruption of services. Contractor to provide prior (at least 1 week) information to public on likely utility service disruptions, and contingency measures to be put in place	Contractor in coordination with PSC/PIU	PSC/PIU	Contractor costs
Construction of labour camps, stockpile areas, storage areas,	Conflicts with the local community; disruption to traffic flow and	i. ii.	Prioritize areas within or nearest possible vacant space in the project location. If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in the destruction of property,	Contractor to finalize locations in consultation and approval of PSC/PIU	PSC/PIU	Contractor costs

Table 43: Pre- construction Environmental Impacts and Mitigation Measures

Field	Anticipated	Mitigation Measures	Implementing	Monitoring	Cost and
	Impact		agency	Responsibility	Source of Funds
and disposal areas.	sensitive receptors	 vegetation, irrigation, and drinking water supply systems. iii. Do not consider residential areas. iv. Take extreme care in selecting sites to avoid direct disposal of excavated earth / demolition waste to a water body which will cause inconvenience to the community. ii. For excess spoil disposal, ensure (a) site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, written consent from landowners (not lessees) will be obtained; (b) debris disposal site shall be at least 200 m away from surface water bodies; (c) no residential areas shall be located within 50 m downwind side of the site; and (d) site is minimum 250 m away from sensitive locations like settlements, ponds/lakes or other water bodies. 			
Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and waterlogging, and water pollution.	 i. Obtain construction materials only from government-approved quarries with prior approval of PIU ii. PIU to review, and ensure that proposed quarry sources have all necessary clearances/ permissions in place prior to approval iii. Contractor to submit to PIU the documentation every month with the details of the material obtained from each source (quarry/ borrow pit) v. Avoid the creation of new borrow areas, quarries, etc., for the project; if unavoidable, contractor to obtain all clearances and permissions as required under law, including Environmental Clearance (EC) prior to approval by PIU 	Contractor to prepare a list of approved quarry sites and sources of materials with the approval of PSC/PIU	PSC/PIU	Contractor costs
Field	Anticipated	Mitigation Measures	Implementing agency	Monitoring Responsibility	Cost and Source of
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	impact		agency	Responsibility	Funds
Consents, permits, clearances, NOCs, etc.	Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions and/or stoppage of works	 i. Obtain all necessary consents, permits, clearance, NOCs, etc. prior to the award of civil works. ii. No works shall be commenced until CRZ clearance is obtained (Packages with CRZ: 27, 32, 34, 35, 36, 37, 38, 39, 40, 41 and 42) iii. Ensure that all necessary approvals for construction to be obtained by the contractor are in place before the start of construction iv. Acknowledge in writing and provide a report on compliance of all obtained consents, permits, clearance, NOCs, etc. 	Contractor	PSC/PIU	Contractor cost
Chance finds	Damage / disturbance to artifacts	 Contractors to follow these measures in conducting any excavation work Create awareness among the workers, supervisors, and engineers about the chance finds during excavation work Stop work immediately to allow further investigation if any finds are suspected. Inform Tamil Nadu Archaeological Department if a find is suspected and taking any action they require to ensure its removal or protection in situ. 	Contractor	PSC/PIU	Contractor Costs

Table 44: Construction Environmental Impacts and Mitigation Measures

Field	Anticipated Impact	Mitigation Measures	Implementing agency	Monitoring Responsibility	Cost and Source of Funds
EMP Implementation Training	Irreversible impact to the environment, workers, and community	Project manager and all key workers will be required to undergo training on EMP implementation including spoils/waste management, Standard operating procedures (SOP) for construction works; occupational health and safety (OH and S), core labour laws, applicable environmental laws, etc.	Contractor	PSC/PIU	Contractor cost

Field	Anticipated Impact	Mitigation Measures	Implementing agency	Monitoring Responsibility	Cost and Source of Funds
Generation of silt/soil	Land and water pollution due to silt/disposal	 (i) Prepare and implement a Construction Waste (Spoils) Management Plan (format is given in Appendix 3) (ii) As far as possible utilize the debris, silt and excess soil in construction purpose, for example for raising the ground level or construction of access roads etc. (iii) Avoid stockpiling any excess spoils at the site for long time. Excess excavated soils should be disposed off to approved designated areas immediately (Kodungaiyur dumping yard and Perungudi Dump Yard of GCC are the identified dumping areas for the project). (iv) Surplus soil may be used as daily cover / intermediate cover at the dump site (v) Monitoring the quality sediment/silt generated from desilting activity for presence of hazardous substances, and follow the suitable method as per the quality; hazardous waste disposal facility approved by TNPCB 	Contractor	PSC/PIU	Contractor cost
Desilting works	Environmental pollution and occupation health and safety	 (i) Desilting process of surplus canals shall be conducted during the summer season for the storm water and surplus canals. no flow season only (ii) Prior to desilting process, the drains shall be allowed dry so that there is no standing water on silt / sediment (iii) Do not conduct manual desilting process, use appropriate equipment / implements (iv) Desilting shall be conducted in small sections, accumulated water, if any shall not be pumped out, but pumped to adjoining section within the same drain (v) Desilting process shall be conducted in such a way that water content of the silt/sediment is low, so that 	Contractor	PSC/PIU	Contractor cost

Field	Anticipated	Mitigation Measures	Implementing	Monitoring	Cost and
	impact		agency	Responsibility	Funds
		contaminated water is not spilled during the loading, transport and unloading process. The excavated sludge shall be placed temporary in dry areas / desilted portion / banks of the canal/ drain, which will allow the water content in the sludge to drain back to the canal; in no case contaminated water is allowed to flow outside the drain/canal (i) This process shall generate sludge. The excavated sludge shall be stored temporary in dry areas near the banks of the canal/ drain, which will allow the water content in the sludge to drain back to the canal, then the sludge, will be packed in the gunny bags or cloth bags to prevent mixing and flowing into the drain. The desilting process shall be conducted mechanically by Robotic excavator and Amphibian Vehicle (manual desilting process shall be avoided). This also helps in further dewatering of the sludge, which will reduce the weight. The packed gunny bags are then transported to designated dumping locations. Currently some of the identified dumping grounds are Perungudi Dump Yard and Kodungaiyur Dump Yard. During the process, the Workers shall be provided with appropriate PPE's; masks with for safety. Oxygen cylinders and first aid kit shall be made available at the site, which shall be utilised during emergency.			
Air Quality	Dust, and emissions (carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons.) from construction vehicles, equipment, and	 For all construction works Provide a dust screen around e construction sites of storm water pumping stations. Damp down the soil and any stockpiled material on-site by water sprinkling; Stabilize surface soils where loaders, support equipment, and vehicles will operate by using water and maintain surface soils in a stabilized condition Apply water prior to levelling or any other earthmoving activity to keep the soil moist throughout the process Cover the soil stocked at the sites with tarpaulins 	Contractor	PSC/PIU	Contractor costs

Field	Anticipated		Mitigation Measures	Implementing	Monitoring	Cost and
	Impact		-	agency	Responsibility	Source of
			2			Funds
	for drain	VI.	Control access to the work area, prevent			
			unnecessary movement of the vehicle, public			
	CONSTRUCTION		disturbance will minimize dust generation			
		vii	Use terpeuling to sover the losse meterial (soil			
		VII.	use larpaulitis to cover the loose material (soil,			
			trucks;			
		viii.	Control dust generation while unloading the loose			
			material (particularly aggregate, sand, soil) at the			
			site by sprinkling water and unloading inside the			
			barricaded area			
		ix.	Clean wheels and undercarriage of haul trucks			
			prior to leaving the construction site			
		Х.	Ensure that all the construction equipment,			
			machinery are fitted with pollution control devices,			
			which are operating correctly, and have valid			
			pollution under control (PUC) certificate			
		For D	rain works			
		i.	Barricade the construction area using hard			
			barricades (of 2 m height) on both sides			
		ii.	Initiate site clearance and excavation work only			
			after barricading of the site is done			
		iii.	Confine all the material, excavated soil, debris,			
			equipment, machinery (excavators, cranes, etc.,),			
			to the barricaded area			
		iv.	Limit the stocking of excavated material at the site;			
			remove the excess soil from the site immediately			
			to the designated disposal area			
		V.	Undertake the work section-wise, a 500m section			
			should be demarcated and barricaded; open up			
			several such sections at a time, but care shall be taken to locate such sections in different zenes			
		vi	Conduct work convertibly execution drain			
		VI.	conduct work sequentially - excavation, drain			
		1	construction, backning, testing section-wise (for a		1	

Field	Anticipated Impact		Mitigation Measures	Implementing agency	Monitoring Responsibility	Cost and Source of
		vii.	minimum length as possible) so that backfilling, stabilization of soil can be done. Backfilled trench at any completed section after removal of barricading will be the main source of dust pollution. The traffic, pedestrian movement, and wind will generate dust from the backfilled section.			Funas
Surface water quality	Mobilization of settled silt materials and chemical contamination from fuels and lubricants during construction can contaminate nearby surface water quality.	i. ii. iii. iv. v. vi. vii. vii.	All earthworks are conducted during the dry season to prevent the problem of soil/silt run-off during rains Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets; Prioritize the re-use of excess spoils and materials in the construction works. If spoils will be disposed off , only designated disposal areas shall be used; Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies; Place storage areas for fuels and lubricants away from any drainage leading to water bodies; Store fuel, construction chemicals, etc., on an impervious floor, also avoid spillage by careful handling; provide spill collection sets for effective spill management Dispose of any wastes generated by construction activities in designated sites; Conduct surface quality inspection according to the Environmental Management Plan (EMP).	Contractor	PSC/PIU	Contractor costs
Surface and Groundwater quality	Water accumulation in trenches/pits	i. ii.	As far as possible control the entry of runoff from upper areas into the excavated pits, and work area by creation of temporary drains or bunds around the periphery of the work area Pump out the water collected in the pits/excavations to a temporary sedimentation pond; dispose off only clarified water into drainage	Contractor	PSC/PIU	Contractor costs

Field	Anticipated Impact	Mitigat	ion Measures	Implementing agency	Monitoring Responsibility	Cost and Source of
		Canals/streams temporary ponds iii. Consider safety a to accumulation o	after sedimentation in the spects related to pit collapse due f water			Funds
Noise Levels	Increase in noise level due to earth-moving and excavation equipment, and the transportation of equipment, materials, and people	 Plan activities in activities with the noise are conduct which will result in Minimize the noise using vehicle sile noise-reducing m barriers to minimi sensitive receptor Maintain maximul decibels (dBA) where more from the Identify any building and avoiding any vehicles in the vice. Horns should not warn other road u approach; Consult local com to identify and a sensitive active ac	consultation with PIU so that e greatest potential to generate cted during periods of the day the least disturbance; e from construction equipment by encers, fitting jackhammers with ufflers, and use portable street se sound impact to surrounding ; and m sound levels not exceeding 80 ten measured at a distance of 10 e vehicle/s. mgs at risk from vibration damage use of pneumatic drills or heavy inity; be used unless it is necessary to users or animals of the vehicle's munities in advance of the work address key issues, and avoid ve times, such as religious and	Contractor	PSC/PIU	Contractor costs
Landscape and aesthetics – waste generation	Impacts due to excess excavated earth, excess construction materials, and solid waste such as removed concrete, wood, packaging	 Prepare and imp (spoils) Manageme As far as possible in construction purp ground level or con Avoid stockpiling at long time. Exces disposed off to immediately 	lement a Construction Waste nt Plan (refer Appendix 3) utilize the debris and excess soil pose, for example for raising the struction of access roads, etc., ny excess spoils at the site for a s excavated soils should be approved designated areas	Contractor	PSC/PIU	Contractor costs

Field	Anticipated		Mitigation Measures	Implementing	Monitoring	Cost and
	Impact			agency	Responsibility	Funds
	materials, empty containers, spoils, oils, lubricants, and other similar items.	iv. v.	If the disposal is required, the site shall be selected preferably from barren, infertile lands; sites should locate away from residential areas, forests, water bodies and any other sensitive land uses Solid wastes should be properly segregated in biodegradable and non-biodegradable for collection and disposal to the designated solid waste disposal site; create a compost pit at designated sites for disposal of biodegradable waste; pap biodegradable			
		vi.	waste shall be collected separately and disposed to approved designated areas. Residual and hazardous wastes such as oils, fuels, and lubricants shall be disposed off in disposal sites			
		vii.	approved by TNPCB; Prohibit burning of construction and/or domestic waste;			
		viii.	Ensure that wastes are not haphazardly thrown in and around the project site; provide proper collection bins, and create awareness to use the dustbins.			
		ix.	Conduct site clearance and restoration to original condition after the completion of construction work; PIU to ensure that the site is properly restored prior to issuing of construction completion certificate			
Management of flood and drainage during construction works	Impact on the construction site, materials and labours	i. ii.	Contractor in coordination with GCC to plan and schedule the existing drains rehabilitation and surplus canal works duly considering the flood management aspect Plan existing drains rehabilitation and surplus canal works during dry season and ensure that	Contractor to prepare site specific temporary drainage management	PSC/PIU	Contractor costs
		iii.	works are complete before the onset of monsoon If the full works cannot be completed within one dry season (which is likely as the construction period is at least 2 years), works shall be conducted section-wise so that surplus canals and/or existing drains are put into operation prior to onset of monsoon; work sections shall be cleared of	plan in consultation with PSC/PIU		

Field	Anticipated Impact	Mitigation Measures	Implementing agency	Monitoring Responsibility	Cost and Source of
					Funds
		 construction materials, debris and any obstructions creating for construction shall be removed iv. To safeguard works and avoid flood/ water logging, the contractor will prepare a suitable site-specific temporary drainage management plan (including emergency response, clean-up kit and trained personnel, to assist with mitigating the damage) and will implement the same 			
Biological environment	Adverse impacts on Creek and coastal / terrestrial ecosystems due to construction works	 i. No works in the CRZ shall be until clearance under CRZ Notification, 2019 is obtained and complied with conditions, if any, stipulated therein. ii. Implement all measures suggested to manage surface water runoff and quality during the construction works iii. Where necessary, before the monsoon measures actions like, diversion ditches can be created in order to intercept and slow down the speed of runoff into the Creek; small, compacted soil berms can be created to intercept runoff and reduce erosion and sediment transport and can reduce the area of water displacement. iv. Conduct monitoring of sediment and water quality in water bodies and creek as per EMP v. Do not use heavy equipment on the coastal zone; use machinery to the minimum possible extent, and restrict the movement to drain/work area vi. Do not place / store materials, waste or debris in the coastal zone vii. Do not remove vegetation or trees viii. Create awareness among the workers and staff on the coastal environment sensitivity, and ensure no damage/disturbance to flora and fauna 	Contractor	PSC/PIU	Contractor costs
Accessibility	Traffic problems	Drain Construction	Contractor	PSC/PIU	Contractor
and traffic	and conflicts	i. Prepare a traffic management plan for			costs
aisruptions	near project	drains works along the roads		1	1

Field	Anticipa	ted		Mitigation Measures	Implementing	Monitoring	Cost and
	Impac	t			agency	Responsibility	Source of
							Funds
	locations	and	ii.	Prepare a drain construction implementation plan in			
	haul road			each zone separately and undertake the work			
				accordingly; ensure that for each road where the			
				work is being undertaken there is an alternative road			
				for the traffic diversion; take up the work in a			
				sequential way so that public inconvenience is minimal			
			iii.	Plan the drain construction in coordination with the			
				traffic police; provide temporary diversions, where			
				necessary and effectively communicate with the general public			
			iv	Avoid construction work in all roads in a colony at			
				one go: it will render all roads unusable due to			
				excavations at the same time, creating large scale			
				inconvenience			
			v.	Undertake the work section wise, a 500 m section			
				should be demarcated and barricaded; open up			
				several such sections at a time, but care shall be			
				taken to locate such sections in different zones			
			vi.	Confine work areas in the road carriageway to the			
				minimum possible extent; all the activities, including			
				material and waste/surplus soil stocking should be			
				confined to this area.			
			vii.	Proper barricading should be provided; avoid			
				material/surplus soil stocking in congested areas -			
				immediately removed from site/ or brought to the site			
				as and when required			
			viii.	Limit the width of trench excavation as much as			
				possible by adopting best construction practices;			
				adopt vertical cutting approach with proper shoring			
				and bracing; this is especially to be practiced in			
				narrow roads and wider/deeper drains; i deep			
				trenches are excavated with slopes, the roads may			
				render completely unusable during the construction period			
			ix.	Leave spaces for access between mounds of soil to			
				maintain access to the houses/properties; access to			

Field	Anticipated	Mitigation Measures	Implementing	Monitoring	Cost and
	Impact		agency	Responsibility	Source of
		 any house or property shall not be blocked completely; alternative arrangements, at least to maintain pedestrian access at all times to be provided x. Provide pedestrian access in all the locations; provide wooden/metal planks over the open trenches at each house to maintain the access. xi. Inform the local population 1-week in advance about the work schedule xii. Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum. xiii. Keep the site free from all unnecessary obstructions. xiv. Notify affected public by public information notices, providing signboards informing nature and duration of construction works and contact numbers for concerns/complaints. Provide information to the public through media – newspapers and local cable television (TV) services xv. At the worksite, public information/caution boards shall be provided including contact for public complaints 			runas
		 Hauling (material, waste/debris, and equipment) activities i. Plan transportation routes so that heavy vehicles do not use narrow local roads, except near delivery sites ii. Schedule transport and hauling activities during nonpeak hours; iii. Locate entry and exit points in areas where there is low potential for traffic congestion; iv. Drive vehicles in a considerate manner 			
		 Notify affected public by public information notices, providing signboards informing nature and duration of construction works and contact numbers for concerns/complaints. 			

Field	Anticipated		Mitigation Measures	Implementing	Monitoring	Cost and
	Impact			agency	Responsibility	Source of
						Funds
Socio- Economic Loss of access	Loss of income	i.	Inform all businesses and residents about the nature and duration of any work well in advance so that they can make necessary preparations;	Contractor	PSC/PIU	Contractor costs
to houses and business		ii.	Do not block any access; leave spaces for access between barricades/mounds of excavated soil and other stored materials and machinery, and providing footbridges so that people can crossover open trenches			
		iii.	Barricade the construction area and regulate the movement of people and vehicles in the vicinity, and maintain the surroundings safely with proper direction boards, lighting and security personnel – people should feel safe to move around			
		iv. v.	Control dust generation Immediately consolidate the backfilled soil and restore the road surface; this will also avoid any business loss due to dust and access inconvenience of construction work.			
		vi.	Employee best construction practices, speed up construction work with better equipment, increase the workforce, etc., in the areas with predominantly commercial, and with sensitive features like hospitals, and schools;			
		vii.	Consult businesses and institutions regarding operating hours and factoring this in work schedules; and			
		viii.	Provide signboards for pedestrians to inform the nature and duration of construction works and contact numbers for concerns/complaints.			
Socio- Economic - Employment	Generation of temporary employment and an increase in local revenue	i. ii.	Employ local labour force as far as possible Comply with labour laws	Contractor	PSC/PIU	Contractor costs
Occupational Health and Safety	Occupational hazards which	i.	Follow all national, state and local labour laws (an indicative list is given in Appendix 2);	Contractor	PSC/PIU	Contractor costs

Field	Anticipated	Mitigation Measures	Implementing	Monitoring	Cost and
	Impact	•	agency	Responsibility	Source of
					Funds
	can arise during	ii. Develop and implement site-specific occupational			
	work	health and safety (OH and S) Plan which shall			
		include measures such as (a) safe and documented			
		construction procedures to be followed for all site			
		activities; (b) ensuring all workers are provided with			
		and use personal protective equipment; (c) OH and			
		S, training for all site personnel, (d) excluding public			
		from the work sites; and (e) documentation of work-			
		related accidents; Follow International Standards			
		such as the World Bank Group's Environment,			
		Health, and Safety Guidelines.			
		iii. Ensure that qualified first-aid specialist is provided at			
		all times in the project area. Equipped first-aid			
		stations shall be easily accessible throughout the			
		sites;			
		iv. Secure all installations from unauthorized intrusion			
		and accident risks			
		V. Provide OH and S orientation training to all new			
		workers to ensure that they are apprised of the basic			
		site rules of work at the site, personal protective			
		protection, and preventing injuring to fellow workers;			
		VI. Provide visitor orientation if visitors to the site can			
		gain access to areas where hazardous conditions of			
		visitario de pet enter hezerd graes uposserted:			
		vii Ensure the visibility of workers through their use of			
		high visibility vests when working in or walking			
		through heavy equipment operating areas:			
		viii Ensure moving equipment is outfitted with audible			
		hack-up alarms:			
		ix. Mark and provide signboards for hazardous areas			
		such as energized electrical devices and lines.			
		service rooms housing high voltage equipment, and			
		areas for storage and disposal. Signage shall be			
		following international standards and be well known			
		to, and easily understood by workers, visitors, and			
		the general public as appropriate; and			

Field	Anticipated	Mitigation Measures	Implementing	Monitoring	Cost and
	Impact		agency	Responsibility	Source of Funds
		 x. Disallow worker exposure to noise level greater than 85 dBA for more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively. xi. Provide supplies of potable drinking water; xii. Provide clean eating areas where workers are not exposed to hazardous or noxious substances 			
COVID 19 response	Spread of infection which causes serious symptoms like difficulty in breathing, chest pain and loss of speech or movement. If not treated it will lead to death	 i. Taking cognizance of situation at time of mobilization, the Contractor shall undertake a COVID risk assessment of project area and prepare a COVID Response and Management Plan (C-R&MP) and submit to GCC and PSC for approval. ii. The preparation of C-R&MP shall consider guidance of Government of India, World Health Organization, International Labour Organization, International Financial Corporation and World Bank's interim guidance note etc. The key points on COVID Response and Management measures is at Appendix 14. iii. The contractor shall submit a weekly monitoring and progress report to GCC and PSC. 	Contractor	PSC/PIU	Contractor costs
Community Health and Safety.	Traffic accidents and vehicle collision with pedestrians during material and waste transportation	 i. Confine work areas; prevent public access to all areas where construction works are on-going through the use of barricading and security personnel ii. Attach warning signs, blinkers to the barricading to caution the public about the hazards associated with the works, and presence of road side excavation iii. Minimize the duration of time when the drain trench is left open through careful planning; plan the work properly from excavation to refilling iv. Control dust pollution – implement dust control measures as suggested under air quality section v. Ensure appropriate and safe passage for pedestrians along with the worksites vi. Provide road signs and flag persons to warn of on-going trenching activities. 	Contractor	PSC/PIU	Contractor costs

Field	Anticipated	Mitigation Measures	Implementing	Monitoring	Cost and
	Impact		agency	Responsibility	Source of Funds
		 vii. Restrict construction vehicle movements to defined access roads and demarcated working areas (unless in the event of an emergency) viii. Enforce strict speed limit (20 kmph) for plying on 			
		unpaved roads, construction tracks ix. Provide temporary traffic control (e.g. flagmen) and signs where necessary to improve safety and smooth traffic flow			
		x. Where traffic is diverted around crossings, traffic control or careful selection of the exit from the working areas will be provided to ensure that vehicles join the road in a safe manner.			
		 At sensitive locations particularly where there are schools and markets close to the road, awareness of safety issues will be raised through neighborhood awareness meetings 			
		xii. All drivers and equipment operators will undergo safety training			
		xiii. Maintain regularly the construction equipment and vehicles; use manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.			
Safety Requirements for Deep Trench works	Accidents, and risk hazard	 (i) Sides of excavation shall be inspected by PSC during the course of excavation from time to time and after every rain, storm or other hazard-increasing occurrence and protection against slides and cavings shall be increased, if necessary (ii) Complete information on the underground structures (such as water pipelines, sewers, gas mains, electrical conduit system and other civic facilities) should be collected before doing the excavation work. Proper precautions shall be taken to prevent accident to the workmen engaged in excavation work and calamities for the general public 	Contractor	PSC/PIU	Contractor costs
		(iii) Where medical facilities (including hospitals) are not available nearby, first-aid kit should be			

Field	Anticipated		Mitigation Measures	Implementing	Monitoring	Cost and
	Impact			agency	Responsibility	Source of
						Funds
			available. This shall be kept at a conspicuous place			
			In the charge of trained person(s). The kit shall be			
		(1)	Lebora shall be instructed to use sefety devices			
		(17)	and appliances provided to them whenever it is			
			necessary to do so			
		(v)	Labors who are not aware of the hazards peculiar			
		()	to the work shall not be permitted to proceed with			
			the work without being properly instructed.			
		(vi)	Safety helmets shall be worn by all persons			
		. ,	entering trench where hazards from falling stones,			
			timber or other materials exist			
		(vii)	Appropriate safety footwear (rubber boots,			
			protective covers, etc.,) shall be worn by labours			
			who are engaged in work requiring such protection			
		(viii)	All trenches in soil more than 1.5 m deep shall be			
			securely shored and timbered.			
		(ix)	All trenches in friable or unstable rock exceeding 2			
			m in depth shall be securely shored and timbered			
		(X)	Where the sides of trenches are sloped but not			
			within 1.5 m of the bottom, the vertical sides shall			
			be shored and the shoring shall extend at least 30			
			cm above the vertical sides. When open spaced			
			sneatning is used, a toe board shall be provided to			
			into the part of the trapph with vertical wells			
		(vi)	Shoring and timboring shall be carried along with			
		(,,,)	the opening of a trench but when conditions permit			
			protection work such as sheet niling may be done			
			before the excavation commences			
		(xii)	Approved quality of sal wood shall be used for			
		(,,,,)	shoring and timbering a trench. Any other			
			structural material having strength not less than			
			that of sal wood may also be used for the purpose.			
			· · · · · · · · · · · · · · · · · · ·			
Work Camps	Temporary air	i.	Consult PIU before locating project offices, sheds,	Contractor	PSC/PIU	Contractor
and worksites	and noise		and construction plants;			costs

Field	Anticipated		Mitigation Measures	Implementing	Monitoring	Cost and
	Impact		C	agency	Responsibility	Source of
	•			•••		Funds
	pollution from	ii.	Select a campsite away from residential areas (at			
	machine		least 100 m buffer shall be maintained) or locate the			
	operation, water		campsite within the existing facilities of GCC offices			
	pollution from	iii.	Avoid tree cutting for setting up camp facilities			
	storage and use	iv.	Provide a proper fencing/compound wall for			
	of fuels, oils,		campsites			
	solvents, and	v.	Campsite shall not be located near (100 m) water			
	lubricants		bodies, flood plains flood-prone/low lying areas, or			
			any ecologically, socially, archeologically sensitive			
	Unsanitary and		areas			
	poor living	vi.	Separate the workers living areas and material			
	conditions for		storage areas clearly with a fencing and separate			
	workers		entry and exit			
		vii.	Ensure conditions of livability at work camps are			
			maintained at the highest standards possible at all			
			times; living quarters and construction camps shall			
			be provided with standard materials (as far as			
			possible to use portable ready to fit-in reusable			
			cabins with proper ventilation); thatched huts, and			
			facilities constructed with materials like GI sheets,			
			tarpaulins, etc., shall not be used as accommodation			
			for workers			
		viii.	Camps shall be provided with proper drainage, there			
			shall not be any water accumulation			
		ix.	Provide drinking water, water for other uses, and			
			sanitation facilities for employees			
		х.	Prohibit labours from cutting of trees for firewood;			
			The contractor should provide cooking fuel (cooking			
			gas); use of firewood is not allowed			
		xi.	Train employees in the storage and handling of			
			materials which can potentially cause soil			
			contamination			
		xii.	Wastewater from the camps shall be disposed off			
			properly either into the sewer system; if the sewer			
			system is not available, provide on-site sanitation			
			with a septic tank and soak pit arrangements			

Field	Anticipated		Mitigation Measures	Implementing	Monitoring	Cost and
	Impact			agency	Responsibility	Source of
						Funds
		xiii.	Recover used oil and lubricants and reuse or remove			
			from the site;			
		xiv.	Manage solid waste according to the following			
			preference hierarchy: reuse, recycling, and disposal			
			to designated areas; provide a compost pit for			
			biodegradable waste, and non-biodegradable /			
			recyclable waste shall be collected and sold in the			
			local market			
		XV.	Remove all wreckage, rubbisn, or temporary			
		NO VI	At the completion of work, the comp cross shall be			
		XVI.	At the completion of work, the camp area shall be			
			submit a report to PILI: PILI to review and approve			
			camp clearance and closure of worksite			
Post-	Damage due to	i	Remove all spoils wreckage rubbish or temporary	Contractor	PSC/PIU	Contractor
construction	debris, spoils,		structures (such as buildings, shelters, and latrines)			costs
clean-up	excess		which are no longer required; and			
•	construction	ii.	All excavated roads shall be reinstated to the original			
	materials		condition.			
		iii.	All disrupted utilities restored			
		iv.	All affected structures rehabilitated/compensated			
		٧.	The area that previously housed the construction			
			camp is to be checked for spills of substances such			
			as oil, paint, etc. and these shall be cleaned up.			
		VI.	All hardened surfaces within the construction camp			
			area shall be ripped, all imported materials removed,			
			the guidelines set out in the reversed using			
			specification that forms part of this document			
		vii	The contractor must arrange the cancellation of all			
		v /1.	temporary services			
		viii.	Request PIU to report in writing that worksites and			
			camps have been vacated and restored to pre-			
			project conditions before acceptance of work.			

Field	Anticipated Impact	Mitigation Measures	Responsibility of Mitigation	Monitoring responsibility	Cost and Source of Funds
Storm Drains	Mixing of Sewage or industrial water	 i. Commissioning of the underground sewerage system with proper connection to be given ii. Prevention of illegal discharge of industrial water by monitoring environmental water quality parameters 	PIU (GCC) in coordination with CMWSSB	PMU	PMU
	Regular Maintenance	 i. Desilting the drain prior to monsoon ii. Clearing of vegetation along the drain iii. Immediate repairing of damaged structures iv. Conducting awareness program to the people residing next to storm drains 	Contractor (Till DLP) and PIU	PMU	Operating Costs
	Maintenance	 It shall be ensured drains are not clogged. The following practices should be adopted in maintaining storm water drains: Drains shall be regularly inspected and cleaned especially prior to monsoons. all damaged or missing drain covers should be replaced immediately Rubbish and silt that have been removed from the drainage system should not be left alongside the drain and shall be immediately disposed off in a pre-identified site with necessary precautions. It shall be ensured that the Environmental, Health, and Safety Guidelines of the World Bank (Generic and Water & Sanitation) have adhered to relevant activities during operation. Avoid mixing wastewater from the household, commercial, industrial and other establishments. Provision for connecting domestic liquid waste to the sewerage system is to be made during drain construction to avoid mixing of wastewater. vii. Periodical monitoring shall be carried out and sources of wastes/ effluent etc. are to be identified. GCC may initiate action to ensure proper linking of such connections to other waste disposal systems and it shall be ensured that the drains carry only the rainwater. viii. In case of any industrial effluent identified, necessary action be taken in coordination with the TNPCB. 	Contractor (Till DLP) and PIU	PMU	Operating Costs

 Table 45: Operation Stage Environmental Impacts and Mitigation Measures

Field	Anticipated Impact		Mitigation Measures	Responsibility of Mitigation	Monitoring responsibility	Cost and Source of Funds
	Tree Planting & Protection (It is estimated to cut 304 trees located in the Storm water drain alignment)	i. ii.	As per the High Court Order as a compensatory measure in the ration of 1:10, 3040 trees have to be planted. GCC (Storm Water Department) has decided to handover the compensatory plantation to Park Department (another wing of GCC) for which the estimated amount will be remitted to the Park Department. Tree transplantation option shall be explored to minimize the loss of trees. The growth and survival of planted trees shall be ensured and monitored by the ESS, PSC and the PIU. The survival status shall be recorded monthly and it will be included in the SEMR, which will be submitted to the ADB	Contractor (Till DLP) and PIU	PMU	Operating Costs
	Solid waste Management	i. ii. iii. iv. v. v.	Provide additional bins in critical locations Ensure frequent collection and disposal of waste Carry out periodical awareness programs to educate the public/stakeholders Prevention of dumping of wastes inside the water body through continuous monitoring. Provide the required number of bins at strategic locations around the lakes and the solid wastes generated shall be regularly collected through existing arrangements & manpower available with the GCC. Provide Signage's to create awareness and conduct IEC activities. Display boards carrying the messages of DO's and Don'ts	Contractor (Till DLP) and PIU	PMU	Operating Costs

Table 46: Construction Stage Environmental Monitoring Plan – Storm water drains and Surplus canal

Monitoring	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of
TIEIO					Funds
Ambient air quality	92 location (Sensitive locations, especially in the downwind direction along the alignment and water bodies);	PM ₁₀ , PM _{2.5} , NO ₂ , SO ₂ , CO	Once before Start of construction and yearly 3-times during the construction period for 3 years	Contractor	Cost for implementation of monitoring measures responsibility of contractor (92 x 3 x 3 = 828 samples x Rs.8000/- per sample = Rs.66,24,000)

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds
Ambient noise	92 location (Wherever the contractor decides to locate the equipment yard and at sensitive locations such as school, hospitals, etc. along the alignment)	Day time and night time noise levels (Noise level on dB (A) scale)	Once before Start of construction and yearly 3-times during the construction period for 3 years	Contractor	Cost for implementation of monitoring measures responsibility of contractor (92 x 3 x 3 = 828 samples x Rs.3500/- per sample = Rs.28,98,000)
Surface water quality	92 sampling location representing water quality in the drain, lakes, river	Parameters for Surface water quality standards (IS; 2296) Water pH, TDS, Total hardness, Sulphate, Fluorides, Chloride, Fe, Pb for groundwater.	Once before Start of construction and yearly 2-times during the construction period for 3 years	Contractor	Cost for implementation of monitoring measures responsibility of contractor (92 x 2 x 3 = 552 samples x Rs.6500/- per sample = Rs.35,88,000)
Silt/ Sediment quality	46 sample location in the existing drains/ surplus canals where silt accumulated	Pb, SAR and Oil & Grease, monitoring silt for the presence of toxic metals	Once in a year (after monsoon) during the construction period for 3 years	Contractor	Cost for implementation of monitoring measures responsibility of contractor (46 x 1 x 3 = 138 samples x Rs.7000/- per sample = Rs.9,66,000)
COVID 19	Construction camps/ labour camps and working areas	Common symptoms including Fever, Dry cough and Tiredness.	Daily	Contractor	As per the COVID Response and Management Plan (C- R&MP) prepared by the contractor under the guidance of ESS, PSC
Tree plantation	Public Parks (Areas where plantation is being done)	Survival rate of the plant species	Quarterly	Park Department	Cost for compensatory plantation 3040 (trees) * 1200 (plantation cost per tree sapling including 3 maintenance) = Rs 36,48,000

Monitoring field	Monitoring location	Monitoring parameters	Frequency	Responsibility	Cost and Source of Funds	
Surface water quality	46 sample location representing water quality in the drain, lakes, river	Parameters for Surface water quality standards (IS; 2296). Water pH, TDS, Total hardness, Sulphate, Fluorides, Chloride, Fe, Pb for groundwater.	Yearly once during the Defect Liability Period (DLP) for 2 years	Contractor	Cost for implementation of monitoring measures responsibility of contractor (46 x 1 x 2 = 92 samples x Rs.6500/- per sample = Rs.5,98,000)	
Silt quality	46 location in the drains where silt accumulated	Pb, SAR and Oil & Grease, monitoring silt for the presence of toxic metals	Yearly once during the Defect Liability Period (DLP) for 2 years	Contractor	Cost for implementation of monitoring measures responsibility of contractor (46 x 1 x 2 = 92 samples x Rs.7000/- per sample = Rs.6,44,000)	

Table 47: Operation Stage Environmental Monitoring Plan - Storm water drains and surplus canals

B. Implementation Arrangements

Executing Agency (EA) for the project is the Municipal Administration & Water Supply 195. (MAWS) Department of GoTN and GCC is the IA. A PMU reporting to the MAWS Department shall be established within GCC and a PIU shall be established in the storm water drain department of GCC. The PMU shall ensure EMP is implemented as agreed while the PIU shall have overall responsibility for implementing environmental safeguards by monitoring and ensuring compliance with ADB's Safeguards Policy and government requirements, obtaining the right of way clearances and ensuring integration of environmental safeguards in all documents. particularly in tender documents. PIU shall also prepare and submit to ADB periodic environmental safeguards monitoring reports. One Executive Engineer in the PIU shall be the nodal officer for environmental and social safeguards who will be responsible to oversee all safeguards related activities. PIU shall have an Environmental Unit headed by a dedicated environmental officer appointed to manage project's compliance with environmental safeguards requirements of ADB SPS. He will be supported by the environmental expert and the environmental safeguards support staff of the PSC. Each contract package shall have the contractor's environmental safeguards officer and safety engineer/ accident prevention officer for regular site supervision and management of EHS during construction. The individual roles and responsibilities for environmental safeguards implementation at PIU, PSC and Contractors' level are further described below.

196. **Environmental Officer at PIU with support from field engineers of PIU:** Key tasks and responsibilities of the Environmental Officer, PIU for this subproject include the following:

- (i) Oversee preparation of IEEs; confirm existing IEEs/EMPs are updated based on detailed designs.
- (ii) Ensure that EMPs are included in bidding documents and civil works contracts
- (iii) Provide oversight on environmental management aspects of the project and ensure EMPs are implemented by contractors.
- (iv) Facilitate and ensure compliance with all government rules and regulations regarding site and environmental clearances, as well as any other environmental requirements (e.g., location clearance certificates, environmental clearance certificates, etc.), as relevant.
- (v) Supervise and provide guidance to the contractor to properly carry out the environmental monitoring as per the monitoring plan.
- (vi) Review, monitor, and evaluate the effectiveness with which the EMPs are implemented, and recommend corrective actions to be taken as necessary
- (vii) Consolidate monthly environmental monitoring reports for different packages and submit semi-annual monitoring reports to ADB (see the format in **Appendix 7**).
- (viii) Ensure timely disclosure of final IEEs/EMPs in locations and ensure accessible to the public
- (ix) Address any grievances brought about through the grievance redress mechanism in a timely manner.
- (x) Review and finalize project environmental category.

197. Environmental Expert of PSC with support from Environmental Safeguards Support Staff of PSC: Key role of Environmental Specialist and Environmental safeguard support staffs for this subproject include the following:

(i) Assist in prepare / update REA checklist

- (ii) Assist in identification of sites/components in compliance with exclusion criteria and project environmental selection guidelines
- (iii) Assist in update / prepare IEE report
- (iv) Provide guidance and oversee work of EHS supervisor
- (v) Assist in conduct public consultation & information disclosure
- (vi) Monitor the implementation of EMP by contractor; report effectiveness and identify the need for corrective actions; work closely with Environmental Officer of PIU
- (vii) Assist in review monthly EMP implementation reports submitted by contractors
- (viii) Oversee and provide guidance to contractors on environmental monitoring (air, noise, etc.)
- (ix) Assist in preparing semi-annual Environmental Monitoring Reports
- (x) Assist in grievance redress and ensure redress
- (xi) Provide regular on-site training programs to contractors site staff and supervisors.

198. **Civil works contracts and contractors**. EMPs are to be included in bidding and contract documents and verified by the PIU. The contractor will be required to appoint an environment safeguards officer and a safety engineer/accident prevention officer to ensure Environment, Health and Safety (EHS) requirements are adequately implemented as per the EMP during civil works. Contractors are to carry out all environmental mitigation and monitoring measures outlined in their contract.

199. The contractor will be required to submit to PIU, for review and approval, a site environmental management plan (SEMP) including:

- (i) Proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes;
- (ii) Specific mitigation measures following the approved EMP;
- (iii) Monitoring program as per SEMP;
- (iv) Site specific OHS plan in accordance with the Health and Safety Plan (COVID 19) and
- (v) Budget for SEMP implementation. No works are allowed to commence prior to approval of SEMP.

200. A copy of the EMP/approved SEMP will be kept on site during the construction period at all times. The EMP included in the bid and contract documents. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

201. The PIU will ensure that bidding and contract documents include specific provisions requiring contractors to comply with:

- (i) All applicable labor laws and core labor standards on
 - a. prohibition of child labor as defined in national legislation for construction and maintenance activities;
 - b. equal pay for equal work of equal value regardless of gender, ethnicity, or caste; and
 - c. elimination of forced labor; and with
- (ii) The requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the project sites.

202. **Prohibited investment activities**. Pursuant to ADB's SPS 2009, ADB funds may not be applied to the activities described on the ADB Prohibited Investment Activities List set forth at **Appendix 5** of the ADB SPS 2009.

C. Training Needs

203. The following Table presents the outline of the capacity building program to ensure EMP implementation. These capacity building and training will be conducted at the offices of PMU and PIU by the environmental safeguards experts of PSC, which are part of project implementation set-up, and therefore no separate or additional costs are envisaged. Adequate costs are already considered in the project's capacity building program. The detailed program and specific modules will be customized for the available skillset after assessing the capabilities of the target participants and the requirements of the project by the PMU.

Description	Target Participants and Venue	Cost and Source of Funds
 Introduction and Sensitization to Environmental Issues (1 day) ADB Safeguards Policy Statement Government of India and Tamil Nadu applicable safeguard laws, regulations and policies including but not limited to core labour standards, OH and S, etc. Incorporation of EMP into the project design and contracts Monitoring, reporting and corrective action planning 	All staff and consultants involved in the project At PMU	Included in the overall program cost
 2. EMP implementation (1/2 day) EMP mitigation and monitoring measures Roles and responsibilities Public relations, - Consultations Grievance redress Monitoring and corrective action planning Reporting and disclosure Construction site standard operating procedures (SOP) Traffic management plan Site clean-up and restoration 	All PIU staff, contractor staff, and consultants involved in the subproject. At PIU	To be conducted by PSC at the PIU office; part of project implementation cost
 3. Contractors Orientation to Workers (1/2 day) - Environment, health, and safety in project construction 	Once before initiation of work, and thereafter regular briefing every month once. A daily briefing on safety prior to the start of work All workers (including unskilled laborers)	Contractors' EHS officer to conduct the program, with the guidance of PSC

Table 48: Outline Capacity Building Program on EMP Implementation

D. Monitoring and Reporting

204. Immediately after mobilization and before commencement of the works, the contractor will submit a compliance report to PIU that all identified pre-construction mitigation measures as

detailed in the EMP are undertaken. The contractor should confirm that the staff for EMP implementation (EHS supervisor) is mobilized. PIU will review and approve the report and permit commencement of works.

205. During construction, results from internal monitoring by the contractor will be reflected in their monthly EMP implementation reports to the PIU. PSC will monitor, review and advise contractors for corrective actions if necessary. A quarterly report summarizing compliance and corrective measures, if any, taken will be prepared by PSC team at PIU and submitted to PMU. During operation, PIU will conduct management and monitoring actions as per the operation stage EMP and submit to PMU an annual report.

206. Based on PIU Quarterly monitoring reports and oversight visits to subproject work sites, PMU will submit a semi-annual Environmental Monitoring Report (EMR). Once concurrence from the ADB is received the report will be disclosed on, GCC websites.

207. ADB will review project performance against the commitments as agreed in the legal documents (loan and project agreements etc,). The extent of ADB's monitoring and supervision activities will be commensurate with the project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system.

E. EMP Implementation Cost

208. Most of the mitigation measures require the contractors to adopt good site practices, which should be part of their normal procedures already, so there are unlikely to be major costs associated with compliance. The costs which are specific to EMP implementation and are not covered elsewhere in the projects are given below.

SI.n	Management Activities	Qty	Rate	Cost (Rs.)	Remarks
A	During Construction Phase		(KS.)		
1	Compensatory plantation with tree guards wherever necessary after the completion of the activity (plantation of 3040 trees and landscaping works) including maintenance during O&M	3040	1200	36,48,000	Included in EMP Cost
2	Monitoring of Baseline parameters for Drains and surplus canal (ambient air quality, Ambient noise levels, water quality (surface and groundwater), soil quality etc)			1,40,76,000	Refer Environmental Monitoring Plan
	Sub Total-A			1,77,24,000	
В	During the Operational Phase				
3	Monitoring of Baseline parameters for Drains and surplus canals (ambient air quality, Ambient noise levels, water quality (surface and groundwater), soil quality etc)			12,42,000	Refer Environmental Monitoring Plan
	Sub Total-B			12,42,000	
С	Capacity Building				

Table 49: Cost Estimates to Implement the EMP

SI.n o	Management Activities	Qty	Rate (Rs.)	Cost (Rs.)	Remarks
4	Orientation workshop for officials involved in the project implementation on ADB Safeguards Policy Statement and environmental assessment process	LS		5,00,000	
5	Induction course to contractors, preparing them for environmental management plan (EMP) implementation and environmental monitoring requirements related to mitigation measures; and taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during implementation	LS		5,00,000	
	Sub Total-C			10,00,000	
	Total Cost for Compensatory Plantation, Baseline parameters during construction, Environmental parameters during operation and Capacity Building			1,99,66,000	

209. The process described in this document has assessed the environmental impacts of all elements of the proposed storm water drainage project in Zone 1, 2, 3, 6, 7 and 8 of Greater Chennai Corporation. As per the ADB SPS 2009 requirements, this project has been categorized as "B". The proposed storm water drain project components does not fall under the ambit of the EIA Notification 2006, and therefore EIA Study or EC is not required for the subproject. Project area is along the coramondel coast of the Bay of Bengal, and some components fall within the Coastal Regulation Zone. Project therefore requires clearance / no objection certificate from TNSCZMA. GCC already submitted application to TNSCZMA and is currently under process. Works falling under CRZ are confined 11 of total 46 contract packages under the project. No works will be initiated in CRZ packages until the clearance/no objection is obtained from TNSCZMA.

210. Baseline environmental monitoring conducted for (i) Air quality shows a significant increase in the PM_{10} at Tiruvoittyur, Kathivakkam and Athipattu, the observed values are 112, 103 and 107 µg/m³ respectively. Other Key air quality parameters are observed to be well within the limits. (ii) Ambient Noise levels around the study area is well within the stipulated limit as per the Noise Pollution (Regulation and Control) Rules 2000 as well as World Bank Group's EHS Noise Level Guidelines, (iii) Silt analysis for the samples collected from the drains and surface water bodies (tanks/ lakes) shows the metal content is less than the detectable limits, (iv) Groundwater quality shows high concentration of TDS, chloride and sulphites for the samples collected from the project area including Ambattur, Pattaravakkam, Retteri, Manali and Ennore, (v) Surface water quality in the Ambattur, Korattur and Retteri lakes comply to IS 2296 – Class C – Drinking water with conventional treatment followed by disinfection. However, the samples collected from Kosasthalaiyar Water Shed and Buckingham Canal shows very high concentration of TDS, Iron (Fe), Chloride (CI) and Manganese (Mn).

211. Based on the project design and the existing baseline environmental conditions, all potential impacts were identified in relation to pre-construction, construction, and operation phases. Planning principles and design considerations have been reviewed and incorporated into the site planning and design process wherever possible; thus, environmental impacts as being due to the project design or location were not significant. Mitigation measures have been developed to reduce negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result, significant measures have already been included in the designs for the infrastructure. This means that the number of impacts and their significance has already been reduced by amending the design. It is estimated to remove/cut 304 trees located within the alignment ROW, tree transplantation options shall be explored. However, for the loss of trees a compensatory afforestation of 3040 trees shall be planted. Various designrelated measures suggested for providing plantation of trees in available space at GCC Parks and water bodies, standard operating procedures for operation and maintenance; imparting necessary training for GCC staff; and providing the necessary safety measures including adequate response measures to COVID-19 during implementation.

212. This project will positively contribute to improve the situation along the coast and Ennore creek that receives storm water / runoff from the project area. Ennore Creek was once a biodiversity hotspot and now highly degraded due to various human activities. The project will improve quality of water flowing into the creek. Besides desilting of canals and drains and providing proper storm water drainage system, the proposed project design also considers minimizing the silt and sewage flow in the system. Water quality of Kosasthalaiyar River, Surplus channels, Buckingham and Ennore creek will be tested pre, during and post construction and

operation phase to monitor the changes in water quality as per the baseline condition. Various measures are suggested to avoid sediment and contaminated flow into the coastal water during the construction. Moreover, works in the CRZ area will be initiated only after obtaining due permission from TNSCZMA.

213. The site selected for Storm water pumping stations are located near North Buckingham Canal. The land is owned by GCC. The nearest house is located at a distance of 30m from the site boundary. Considering the current and future development, various measures are included in the subproject design, including sensitive layout design by maintaining adequate distance from the boundary, so that the pumping station is located within the project site. Both the pumping station sites (at Kargil Nagar and Ernavoor) are situated on government-owned vacant land, and storm water drains will be laid on the public roads. Therefore, project does not involve any private land acquisition.

214. The proposed construction activities likely to generate 2 million cubic meter of surplus earth, which shall be recycled to the maximum, the remaining surplus earth will be disposed/ dumped in the Kodungaiyur dumping yard, which is owned and maintained by GCC. Project is also estimated to generate nearly 150,000 m³ of sediment/deslited material from the storm water drains and surplus canals. Sediment quality analysis indicate that material is not hazardous and will be disposed at the solid waste dumping sites owned by GCC. During the construction, confirmatory tests will be conducted, and reuse of dried and non-hazardous silt/sediment for beneficial purposes will be explored and implemented, and the surplus will be disposed off at the solid waste facilities.

215. Storm water drain works will be constructed along public roads in an urban area congested with people, activities, and traffic, project is likely to significant impacts during construction. Impacts mainly arise from the construction dust and noise; from the disturbance of residents, businesses, traffic by the construction work, safety risk to workers, public and nearby buildings due to trench excavations, especially in narrow roads, dust, access impediment to houses and business, disposal of large quantities of construction waste, etc. These are all general impacts of construction in urban areas, and there are well-developed methods of mitigation that are suggested in the EMP.

216. Once the new system is operating, the facilities will operate with routine maintenance, which should not affect the environment. Improved system operation will comply with the operation and maintenance manual and standard operating procedures developed for all the activities.

217. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to the PMU. Mitigation and monitoring measures, along with the project agency responsible for such actions, form part of the Environmental Management Plan.

218. Stakeholders were involved in developing the IEE through face-to-face discussions, onsite meetings, and a city level consultation workshop, which was conducted for larger public participation in the project. Views expressed by the stakeholders were incorporated into the IEE and the planning and development of the project. Focus group discussions are conducted at nine locations. It was observed that people are willing to extend their cooperation, as the proposed project will provide storm water drainage system, enhance basic infrastructure service levels and overall living standards of the public. The consultation process will be continued during project implementation to ensure that stakeholders are engaged in the project and have the opportunity to participate in its development and implementation. The project's grievance redress mechanism will provide the citizens with a platform for redressing their grievances, and describes the informal and formal Canals, period, and mechanisms for resolving complaints about environmental performance.

219. The EMP will assist the project agencies and contractors in mitigating the environmental impacts and guide them in the environmentally sound execution of the proposed project. A copy of the updated EMP shall be kept on-site during the construction period at all times. The EMP shall be made binding on all contractors operating on the site and will be included in the contractual clauses. Non-compliance with or any deviation from the conditions set out in this document shall constitute a failure in compliance. The prepared Draft IEE will be made available at public locations and will be disclosed to a wider audience via the PMU, GCC and ADB websites.

220. The citizens of Chennai City will be the major beneficiaries of this subproject. The new storm water drainage system will collect storm water from those areas served by the network rapidly and flood mitigation, storm water storage at water bodies, recharge the groundwater level through recharge wells, rainwater harvesting pits, etc., In addition to improved environmental conditions, the subproject will improve the overall public health in the project area. Diseases of poor sanitation, such as diarrhea and dysentery, should be reduced, so people should spend less on healthcare and lose few working days due to illness, so their economic status should also improve, as well as their overall health.

221. Therefore, as per ADB SPS, the project is classified as environmental category B and does not require further environmental impact assessment. However, to conform to government guidelines, drains works, pumping stations and discharge points in CRZ area require permission from Tamil Nadu State Coastal Zone Management Authority (TNSCZMA) before construction. No works in CRZ area shall be initiated until clearance is obtained. This IEE shall be updated by PIU during the implementation phase to reflect any changes, amendments and will be reviewed and approved by PMU.

Rapid Environmental Assessment (REA) Checklist

Urban Development

Instructions:

- (i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.
- (ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.
- (iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country	IND: Proposed Integrated Urban Flood Management for the Chennai -
/Project Title:	Kosasthalaiyar Basin
Sector Division	

ctor Division: Urban Development and Water Division

Screening Questions	Yes	No	Remarks
A. Project Siting			
Is the project area			
Densely populated?	Yes		Kosasthalaiyar project area lies in the expanded areas of GCC and it is densely populated. The total population is 25.80 Lakhs (2011 census). The density of the population is 20,187 / km ² .
Heavy with development activities?	Yes		It is a developing area; Urban expansion is considerable.
□ Adjacent to or within any environmentally sensitive areas?	Yes		 There are two critical habitat areas located within 50km radius of the project area (i) Pulicate Bird Sanctuary is located at a distance of 21 km away from the north boundary of the project area. (ii) Guindy National Park exists at a distance of 10 km away from the south boundary of the project area. However, as per MoEF&CC guideline for assessing biodiversity, the identified critical habitats are away from 10km buffer from the project area
□ Cultural heritage site	Yes		The project area is around 127.80 km ² and hence the chances of heritage sites are possible. However as per the inventory conducted for the surface drainage, it is evident that there is no ASI identified, or cultural heritage of local importance has been observed
□ Protected Area	Yes		Both the critical habitats (Pulicat Bird Sanctuary and Guindy National Park) are declared protected areas. However, it is more than 10km buffer from the project area (as per the stipulated guideline from MoEF&CC)
□ Wetland		No	Pulicat lake is not considered under wetland category

Screening Questions	Yes	No	Remarks
□ Mangrove	Yes		Mangroves exist at a distance of 5km away from the north boundary of the project area.
Estuarine		No	Not applicable
□ Buffer zone of protected area		No	Not applicable
 Special area for protecting Biodiversity 		No	Not applicable
🗆 Bay		No	Not applicable
B. Potential Environmental			
Impacts			
Will the Project cause			
Impacts on the sustainability of associated sanitation and solid waste disposal systems and their interactions with other urban services.		No	No such impact is envisaged. This storm water project is designed without any intervention of other services and has logical disposal arrangements.
Deterioration of surrounding environmental conditions due to rapid urban population growth, commercial and industrial activity, and increased waste generation to the point that both manmade and natural systems are overloaded and the capacities to manage these systems are overwhelmed.		No	The proposed project falls under the storm water drain construction for the locations where it was badly hit by the flooding and stagnation of rain water during monsoon.
degradation of land and ecosystems (e.g. loss of wetlands and wild lands, coastal zones, watersheds and forests)		No	No such impact is anticipated.
dislocation or involuntary resettlement of people		No	This project does not involve resettlement.
degradation of cultural property, and loss of cultural wetlands and wild lands, coastal zones, watersheds and forests)		No	No such impact is anticipated.
occupation of low-lying lands, floodplains and steep hillsides by squatters and low-income groups, and their wetlands and wild lands, coastal zones, watersheds and forests)		No	No such impact is anticipated.
water resource problems (e.g., depletion/degradation of available water supply, deterioration for surface and ground water quality, and pollution of receiving waters		No	Does not arise as the proposed project is to improve the water quality of the receiving water bodies through proposed drains. Groundwater quality through rainwater harvesting structures are improved.
air pollution due to urban emissions		No	Air pollution due to dust is suppressed by sprinkling water during construction. Emissions from vehicles / machineries will be controlled by periodical checking to comply TNPCB standards.
social conflicts between construction workers from other areas and local workers		No	No such impact anticipated; Local communities in the vicinity of the project area would be employed as much as possible.

Screening Questions	Yes	No	Remarks
road blocking and temporary flooding due to land excavation during rainy season	Yes		Complete road blocks are not envisaged; however, in narrow roads, traffic may be diverted but access will be ensured for pedestrians. All necessary precautions will be taken to prevent flooding during construction; flooding is unlikely as work will mostly be conducted during dry season
noise and dust from construction activities	Yes		Micro drains will be constructed along the road sides and hence noise generating activities will be minimal and temporary. Dust generation is possible during excavation. However the entire excavation area is continuously wet during the entire excavation period and dust is supressed at the source itself.
traffic disturbances due to construction material transport and wastes	Yes		Proper planning, such as selection of routes and scheduling to avoid peak traffic hours, will be carried out in consultation with concerned authorities.
temporary silt runoff due to construction	Yes		The deposited silt from the road will be removed and disposed along with the excavated soil. Earthworks will not be conducted during rains;
hazards to public health due to ambient, household and occupational pollution, thermal inversion, and smog formation		No	Not applicable.
water depletion and/or degradation		No	Not applicable.
overpaying of ground water, leading to land subsidence, lowered ground water table, and salinization		No	Not applicable.
contamination of surface and ground waters due to improper waste disposal		No	Does not arise as waste generated will be disposed daily to designated disposal locations.
pollution of receiving waters resulting in amenity losses, fisheries and marine resource depletion, and health problems		No	Not applicable.

A Checklist for Preliminary Climate Risk Screening

Country/Project Title	:	IND: Proposed Integrated Urban Flood Management for the Chennai - Kosasthalaiyar Basin
Sector	:	SAUW
Subsector Division/	:	Urban Development and Water Division
Department		

	Screening Questions	Score	Remarks ¹⁰
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather-related events such as floods, droughts, storms, landslides?	1	The project area is affected by severe floods in the year 2005 and 2015 and hence the project on storm water drain has been proposed
	Would the project design (e.g., the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	1	Yes, being a storm water drain project, the hydro meteorological parameters are considered during the drain network designing
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro- meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	1	Yes, the life of project may get affected due to the weather conditions. However, it is designed as per the CPHEEO norms for better stability and endurance
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	No, climate change will not have much impact on the maintenance. However routine maintenance including de-silting the drain prior to monsoon, clearing of vegetation along the drain, immediate repairing of damaged structures are anticipated
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g., annual power production) of project output(s) (e.g. hydro- power generation facilities) throughout their design life time?	1	Yes, the life of project may get affected due to the weather conditions.

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1

¹⁰ If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Very Likely	2

Responses when added that provide a score of 0 will be considered low <u>risk</u> project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a <u>medium risk</u> category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as <u>high risk</u> project.

Result of Initial Screening (Low, Medium, High): Medium

Other Comments: <u>The proposed storm water drain project, will prevent flooding and stagnation of</u> rainwater, which is a major issue faced by the local community during the monsoon season.

Prepared by: Greater Chennai Corporation (GCC)

SALIENT FEATURES OF MAJOR LABOR LAWS APPLICABLE TO ESTABLISHMENTS ENGAGED IN CONSTRUCTION OF CIVIL WORKS

(i) Workmen Compensation Act, 1923 - The Act provides for compensation in case of injury by accident arising out of and during employment.

(ii) Payment of Gratuity Act, 1972 - Gratuity is payable to an employee under the Act on the satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act applies to all establishments employing 10 or more employees.

(iii) Employees' PF and Miscellaneous Provisions Act, 1952 - The Act provides for monthly contributions by the employer plus workers @10 % or 8.33 %. The benefits payable under the Act are: (a) Pension or family pension on retirement or death as the case may be; (b) deposit linked insurance on the death in the harness of the worker; (c) payment of PF accumulation on retirement/death, etc.

(iv) Maternity Benefit Act, 1951 - The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage, etc.

(v) Contract Labour (Regulation and Abolition) Act, 1970 - The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same is required to be provided by the Principal Employer by Law. The principal employer is required to take a Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act applies to the establishments or Contractor of the principal employer if they employ 20 or more contract labor.

(vi) Minimum Wages Act, 1948 - The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is scheduled. Construction of Buildings, Roads, Runways are scheduled employment.

(vii) Payment of Wages Act, 1936 - It lays down as to by what date the wages are to be paid when it will be paid and what deductions can be made from the wages of the workers.

(viii) Equal Remuneration Act, 1979 - The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees in the matters of transfers, training, and promotions, etc.

(ix) Payment of Bonus Act, 1965 - The Act applies to all establishments employing 20 or more workmen. The Act provides for payments of annual bonus subject to a minimum of 8.33 % of wages and a maximum of 20 % of wages to employees drawing Rs. 3,500/- per month or less. The bonus to be paid to employees getting Rs. 2,500/- per month or above up to Rs.3, 500/- per month shall be worked out by taking wages as Rs.2, 500/- per month only. The Act does not apply to certain establishments. The newly set up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for applicability of the Act.

(x) Industrial Disputes Act, 1947 - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

(xi) Industrial Employment (Standing Orders) Act, 1946 - It applies to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the employer on matters provided in the Act and get the same certified by the designated Authority.

(xii) Trade Unions Act, 1926 - The Act lays down the procedure for registration of trade unions of workmen and employees. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities.

(xiii) Child Labor (Prohibition and Regulation) Act, 1986 - The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for the regulation of employment of children in all other occupations and processes. Employment of child labor is prohibited in the Building and Construction Industry.

(xiv) Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979 - The Act applies to an establishment that employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc

(xv) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996 - All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay Cess at a rate not exceeding 2% of the cost of construction as may be notified by the Government. The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace, etc. The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.
SAMPLE OUTLINE SPOILS (CONSTRUCTION WASTE) MANAGEMENT PLAN

- The Spoil Management Plan should be site-specific and be part of the monthly Construction Management Plan.
- The contractor, in consultation with the PIU, has to find out appropriate location/s for the disposal of the excess soil generated. The spoils should be deposited only at these sites.
- Further precautions need to be taken in case of the contaminated spoils
- The vehicle carrying the spoil should be covered properly.
- The spoils generating from each site should be removed on the same day or immediately after the work is complete. The site/road should be restored to the original condition.

I. Spoils information

The spoil information contains the details like a) The type/material, b) Potential contamination by that type, c) Expected volume (site/component specific), d) Spoil Classification, etc.

II. Spoils management

The Spoil Management section gives the details of a) Transportation of spoil b) disposal site details c) Precautions are taken d) Volume of contaminated spoil, if present, d) Suggested reuse of disposal of the spoil

III. Documentation

The volume of spoil generated (site-specific, date-wise), site disposed of, reuse/disposal details should be documented properly.

Public Information Notice Template

Public Announcement Providing Integrated Storm Water Drains for Kosasthalaiyar Basin in Greater Chennai Corporation

Under this project, works are being conducted by xxxx Contractor to provide storm water drain network in Chennai.

As part of this, works for storm water drain network will be taken up in ------ road----/ street/ lane From.......to (provide dates).

We request you to kindly co-operate for smooth implementation of the works.

We also request you to drive vehicles / pedestrians to walk carefully

Inconvenience caused is regretted.

PSC - Contact No. PIU - Contact No. Contractor – Contact no.

SAMPLE GRIEVANCE REGISTRATION FORM

(To be available in Tamil and English)

The ______Project welcomes complaints, suggestions, queries, and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

Should you choose to include your details but want that information to remain confidential, please inform us by writing/typing *(CONFIDENTIAL)* above your name. Thank you.

Date		Place of registration	Project Town			
			Project:			
Contact information	/perso	onal details				
Name			Gender	* Male * Female	Age	
Home address						
Place						
Phone no.						
E-mail						
Complaint/suggestion grievance below:	on/co	mment/question Please provide the	e details (who, v	vhat, where,	and how	v) of your
If included as attach	nment	/note/letter, please tick here:				
How do you want us	s to re	each you for feedback or updates o	n your commer	nt/grievance?)	

FOR OFFICIAL USE ONLY

Registered by: (Name of official registering grievance)	
Mode of communication:	
Note/letter	
E-mail	
Verbal/telephonic	
Reviewed by: (Names/positions of officials reviewing grievance)
Action was taken:	
Whether action taken disclosed:	Yes
	No
Means of disclosure:	·

SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT

Project Name Contract Number

NAME:	DATE:
TITLE:	DMA:
LOCATION:	GROUP:

WEATHER:

Project	Survey	
Activity	Design	
Stage	Implementation	
	Pre-Commissioning	
	Guarantee Period	

Monitoring Items	Compliance
Compliance marked as Yes / No / Not applicable (NA) / Partially Implemented (PI)	
EHS supervisor appointed by the contractor and available on site	
Construction site management plan (spoils, safety, schedule, equipment etc.,) prepared	
Traffic management plan prepared	
Dust is under control	
Excavated soil properly placed within minimum space	
Construction area is confined; no traffic/pedestrian entry observed	
Surplus soil/debris/waste is disposed of without delay	
Construction material (sand/gravel/aggregate) brought to the site as and when required only	
Tarpaulins used to cover sand and other loose material when transported by vehicles	
After unloading, wheels and undercarriage of vehicles cleaned prior to leaving the site	
No AC pipes disturbed/removed during excavation	
No chance finds encountered during excavation	
Work is planned in consultation with traffic police	
Work is not being conducted during heavy traffic	
Work at a stretch is completed within a day (excavation, pipe laying and backfilling)	
Pipe trenches are not kept open unduly	
Road is not completely closed; work is conducted on edge; at least one line is kept open	
Road is closed; alternative route provided and the public informed, information board provided	
Pedestrian access to houses is not blocked due to pipe laying	
Spaces left in between trenches for access	
Wooden planks/metal sheets provided across trench for pedestrian	
No public/unauthorized entry observed in worksite	
Children safety measures (barricades, security) in place at works in residential areas	
Prior public information provided about the work, schedule and disturbances	
Caution/warning board provided on site	
Guards with red flag provided during work at busy roads	
Workers using appropriate PPE (boots, gloves, helmets, ear muffs, etc)	
Workers conducting or near heavy noise work is provided with ear muffs	
Contractor is following standard and safe construction practices	
Deep excavation is conducted with landslip/protection measures	
First aid facilities are available on-site and workers informed	
Drinking water provided at the site	
Toilet facility provided at the site	

Monitoring Items	Compliance
Separate toilet facility is provided for women workers	
Workers camps are maintained cleanly	
Adequate toilet and bath facilities provided	
Contractor employed local workers as far as possible	
Workers camp set up with the permission of PIU	
Adequate housing provided	
Sufficient water provided for drinking/washing/bath	
No noisy work is conducted in the nights	
Local people informed of noisy work	
No blasting activity conducted	
Pneumatic drills or other equipment creating vibration is not used near old/risky buildings	

Signature

Sign off

Name Position Name Position

SAMPLE SEMI-ANNUAL ENVIRONMENTAL MONITORING REPORT TEMPLATE

A. INTRODUCTION

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009
- Environmental category of each subproject as per national laws and regulations
- Project Safeguards Team

Name	Designation/Office	Email Address	Contact Number
1. PSC			
2. PMU			
3. PIUs			
4. Consultants			

- Overall project and subproject progress and status
- Description of subprojects (package-wise) and status of implementation (preliminary, detailed design, on-going construction, completed, and/or O&M stage)

Package Number	Components/List of Works	Status of Implementation (Preliminary Design/Detailed	Contract Status	If On-going Construction		
		Design/On-going	(specify if	%Physical	Expected	
		Construction/Completed/Oawi)	or contract	Progress	Date	
			awarded)			

B. COMPLIANCE STATUS WITH NATIONAL/STATE/LOCAL STATUTORY ENVIRONMENTAL REQUIREMENTS

¹¹ If on-going construction, include %physical progress and expected date of completion.

Package No.	Subproject Name	Statutory Environmental Requirements ¹²	Status of Compliance ¹³	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish ¹⁴

C. COMPLIANCE STATUS WITH ENVIRONMENTAL LOAN COVENANTS

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

D. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT PLAN (REFER TO EMP TABLES IN APPROVED IEE/S)

• Confirm if IEE/s require contractors to submit site-specific EMP/construction EMPs. If not, describe the methodology of monitoring each package under implementation.

Package	Components	Design Status		Final IEE based on Detailed Design				Remarks
Number (Pre D Stagy Cor	(Preliminary Design Stage/Detailed Design Completed)	Not yet due (detailed design not yet completed)	Submitted to ADB (Provide Date of Submission)	Disclosed on project website (Provide Link)	Final IEE provided to Contractor/s (Yes/No)	EMP (or Construction EMP) approved by Project Director? (Yes/No)		

Package-wise Implementation Status

- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.
- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.
- Include as an appendix all supporting documents including <u>signed</u> monthly environmental site inspection reports prepared by consultants and/or contractors.
- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below

¹² Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)

¹³ Specify if obtained, submitted and awaiting approval, application not yet submitted.

¹⁴Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.

- Provide the monitoring results as per the parameters outlined in the approved EMP (or site-specific EMP/construction EMP when applicable).
- In addition to the table on EMP implementation, the main text of the report should discuss in details the following items:

(i) **Grievance Redress Mechanism.** Provide information on the establishment of a grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).

(ii) **Complaints Received during the Reporting Period.** Provide information on the number, nature, and resolution of complaints received during the reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

- Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
- Identify muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads.
- Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these were intact following heavy rain;
- Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area.
- Confirm spill kits on site and site procedure for handling emergencies.
- Identify any chemical stored on site and provide information on storage conditions. Attach photograph.
- Describe the management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
- Describe the management of solid and liquid wastes on-site (quantity generated, transport, storage, and disposal). Provide photographs.
- Provide information on barricades, signages, and on-site boards. Provide photographs.
- Checking if any activities are being taken out of working hours and how that is being managed.

Summary of Environmental Monitoring Activities (for the Reporting Period)¹⁵

Impacts (List from IEE)	Mitigation Measures (List from IEE)	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name of Person Who Conducted the Monitoring	
Design Pha	ase						
Pre-Constr	Pre-Construction Phase						

¹⁵ Attach Laboratory Results and Sampling Map/Locations

Construction Phase						
Operational Phase						

E. Overall Compliance with EMP

No.	Sub-Project Name	EMP Part of Contract Documents (Y/N)	EMP Being Status of Implemented Implementati (Y/N) (Excellent/ Satisfa Partially Satisfa Below Satisfac		Action Proposed and Additional Measures Required

F. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

• Brief description of the approach and methodology used for environmental monitoring of each subproject.

G. MONITORING OF ENVIRONMENTAL IMPACTS ON PROJECT SURROUNDINGS (AMBIENT AIR, WATER QUALITY AND NOISE LEVELS)

- Brief discussion on the basis for monitoring
- Indicate the type and location of environmental parameters to be monitored.
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and analysis of results concerning baseline data and statutory requirements.

As a minimum, the results should be presented as per the tables below.

All Quality Results						
	Date of Testing	Site Location	Parameters (Government Standards)			
Site No.			ΡΜ _{2.5} μg/m³	ΡΜ ₁₀ μg/m³	SO₂ µg/m³	NO ₂ µg/m ³

Air Quality Results