

5. ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

5.1 Introduction

The current chapters describe probable impact identification on each component of the environment and the compilation of the existing baseline data of those components. The quantification of likely impacts and their evaluation/assessment are discussed in this chapter.

This chapters describes the all the impacts and mitigation measures for improvement of 7 infrastructure facilities.

The proposed 7 infrastructure facilities are:

- i. Improvement to the existing Jawahar dock (East) Berths of handling bulk cargoes –Modernization
- ii. Improvement to the existing Bharathi Dock II Berth for handling bulk cargoes – Modernization
- iii. Relocation of existing Sand Trap and Capital Dredging –change in location
- iv. Development of Multi level car parking facility (5000 cars –New
- v. Development of coastal Terminal (1 MTPA) at northern sheltering arm at east of Bharathi Dock turning circle –New
- vi. Development of Dry dock Facility in the Boat Basin/Timber Pond area –New
- vii. Development of Storage Sheds and Tank Farms as per the Land use plan of the Chennai Port – New

Based on the project details and the baseline environmental status, potential impacts that are expected to accrue as a result of the proposed project have been identified. The assessment for quite a few disciplines is subjective in nature and cannot be quantified.

This chapter identifies and assesses the potential impacts on the environmental and social receptors that could be expected from the proposed project. Some of the planned operations associated with the proposed project have the potential to cause environmental and socio-economic impacts.

Wherever possible, the impacts have been quantified. However, for non-tangible impacts, a qualitative assessment has been done so as to formulate appropriate management measures for them as well. This Chapter deals with anticipated positive as well as negative impacts due to the construction and operation of the proposed projects in Chennai Port. As a part of the study, impacts on various aspects of environment have been assessed. The impacts have been categorized for construction as well as operation phases.

Potential environmental and socio-economic impacts of planned activities include:

- Disturbance to habitat and ecology during the life-cycle of the project;
- Emissions to the atmosphere and contamination of seawater and seabed by liquid discharges during planned as well as potential emergency situations;
- Local socio-economic impacts and disturbance of port users during the construction and operation phases.

5.2 Impacts of the proposed activities

The environment at the project site has been assessed based on a preliminary site survey, involving visual inspection of the project site and its surroundings for the existing infrastructure/conditions, addressing issues as given in Table: 5.1

Table: 5.1 Evaluation of project environs

S.No	Description of project setting	Evaluation
1	Air Pollution Sources	Urban pollution sources
2	Air Quality	Complies with NAAQS
3	Receptors of impact	Local population, workers
4	Water bodies and sources of water supply	Coastal waters, CMWSSB water source
5	General water quality	Coastal waters meet SW-IV standards
6	Waste water/effluent discharge sources, disposal methods/location of disposal	Sewage collection/disposal system during construction activity only
8	Land use at the proposed development area	Port related land use
9	Landscape and terrain	Sandy beach to south, seawalls to north

10	Prominent installations in the project site	None
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Identification of the likely impacts of a project is done to determine all the issues of environmental concern. An overview of impacts likely to occur from the proposed project activities is presented below.

5.3 Methodology Adopted for Assessment of Planned Operations

All key activities that constitute the project were identified together with potential sources of impact associated with each of those activities. Mitigation measures or management controls to be applied to eliminate or minimize adverse impacts were then identified. Mitigation measures include those that can be incorporated in the design phase, and/or implemented during the construction and operational phases.

5.3.1 Prediction of Impacts

Many scientific techniques and methodologies are available to predict impacts to physic-ecological and socio-economic environment. The knowledge about the final impacts of any proposed project at the planning stage helps the decision makers in identification and implementation of proper control measures, if necessary, during the execution of the project or preserves the environment quality.

Anticipated Environmental Impact on the Terrestrial Environment due to proposed development or improvement of 7 infrastructure facilities at Chennai Port is discussed in this chapter.

As the proposed projects having strengthening of existing facilities, relocation of sand trap, development of coastal terminal, Dry dock etc for better assessment project activities were divided into four activities and were given in table below.

The proposed seven activities are classified in to four parts based on their similar impacts:

Table 5.2 Classification of projects based on activities

S.No	Name of the Activity	Coding
1	Improvement to the existing Jawahar dock (East) Berths of handling bulk cargoes –Modernization	Activity -1
2	Improvement to the existing Bharathi Dock II Berth for handling bulk cargoes – Modernization	
3	Development of Dry dock Facility in the Boat Basin/Timber Pond area –New	
4	Relocation of existing Sand Trap and Capital Dredging –change in location	Activity -2
5	Development of coastal Terminal (1 MTPA) at northern sheltering arm at east of Bharathi Dock turning circle –New	Activity -3
6	Development of Multi level car parking facility (5000 cars –New	Activity -4
7	Development of Storage Sheds and Tank Farms as per the Land use plan of the Chennai Port – New	

5.3.2 : Impacts & Mitigation of Activity –I

Activity I is having three projects and first two are strengthening of existing facilities which are modernization projects and third project is up gradation of existing dry dock facilities and is New project.

Table 5.3 Projects in Activity –I:

S.No	Name of the Activity	Coding
1	Improvement to the existing Jawahar dock (East) Berths of handling bulk cargoes –Modernization	Activity -1
2	Improvement to the existing Bharathi Dock II Berth for handling bulk cargoes – Modernization	
3	Development of Dry dock Facility in the Boat Basin/Timber Pond area –New	

Impacts during construction phase:

a) Impacts due to Re-paving operation

The proposed project would require partial removal of surface existing berth structures at JD and BD berths and repaving the same. The proposed up gradation require significant amount of construction material which will be procured from local authorized quarries through contractors. During construction phase, construction & demolition waste generated during repaving/strengthening of the surface will be of approximately 10000 cum which will be stored separately and disposed off by backfilling of low lying areas within port limits. Any excess construction and demolition waste will be handled as per C&D rules 2016.

b) Impact on Air quality:

- *Emissions Sources during the construction phase:*

The only major impacts on air during construction phase are predicted to be caused due to air borne dust arising from the chipping or removal of berth surface and construction activities as well as gaseous pollutants from vehicles used for transportation of construction materials and emission

from equipment used during construction phase. The dust particles in the form of particular matters will strongly depend on various activities like movement of vehicles, their speed, excavation of earth, back filling etc during the construction phase.

The probable sources of the dust are the activities of chipping of berth surface, excavation, filling, leveling etc. The airborne fine particles may have significant impacts on environment. To control the fugitive emissions during construction phase wetting will be done to control the fugitive emissions, covering the construction waste material with taruplin until its disposal for backfill the low lying areas and any excess will be handled as C&D rules 2016. The construction area will be isolated by temporary fencing of aluminum sheets to control the dispersion of air particles into surrounding environment.

To control vehicular emissions vehicles having PUC certificate will be allowed and speed of the vehicles will be less than 25 km. DG sets with acoustic enclosure will be used during construction phase and stack height will be as per CPCB norms. The residual impacts of emission from the vehicles and DG stack would not be significant to cause any considerable impacts on air.

The combustion of diesel in various construction equipment could be one of the possible sources for incremental air pollution during the construction phase. The quantum of diesel consumed is not high to cause any significant impact on ambient air quality.

The impacts on the environment generated during construction phase will be limited to the construction tenure and will be local. Hence looking to the overall facts described above, it can be concluded that the impacts on air due to the construction & erection activities will be minimum or negligible. It is also concluded that by implementing the proper mitigation measures, like sprinkling/wetting of project area with water will minimize the dust emissions including fugitive and by following other above mentioned controlled measures, the impacts will be almost eliminated or minimized to the lowest extent of damage. The proposed project will have no major considerable stress/pressure on the environment to give rise to any significant adverse impacts on environment.

- *Impacts due to transportation of construction materials:*

Vehicular movement from the transportation of construction material in the area is likely to increase temporarily during the construction period. The increase in number of trucks carrying construction material is expected to be in the range of 20-30 per day. The increased vehicular traffic is not expected to cause any significant impact on ambient air quality. During construction phase Ready Mix Concrete will be used to control the emissions in this phase. During the transfer of construction material or waste the truck will be covered with taruplin to control fugitive emissions. These activities lead to be generation of fugitive emissions. However, impact on this account is not expected to be significant and is likely to effect a small strip of along both the sides of road network, over which the trucks carrying construction materials are plying and water wetting activity will be implemented as a mitigation measure for haulage dust control during transportation of vehicles.

- *Impacts due to operation of construction equipment:*

The major pollutant in the construction phase is SPM being air-borne due to various construction activities. The vehicular movement generates pollutants such as NO_x, CO and HC. But, the vehicular pollution is not expected to lead to any major impacts.

The proposed construction area is concrete surface and dust generated during construction phase will be minimal. However, the fugitive emissions generated due to vehicular movement are not expected to travel beyond a distance of 50 to 100m and further wetting of haulage roads will reduce the same. The windblown dust is also likely to be substantial of the project site, hence especially during the summer months. Since, the construction site is isolated with aluminum sheets and there is no habitation with 50m in the vicinity of the site, the major impact on air environment during the construction phase is not expected to be significant as far as air pollutant is concerned. The combustion of diesel in various construction equipment could be one of the possible sources of incremental air pollution during the construction phase.

The quantum of diesel consumed is not high to cause any significant impact on ambient air quality. Thus, the operation of construction equipment is not expected to have any major impact on the ambient air quality as a result of the project.

c. Impact on Water Environment:

Port is drawing water from CMWSSB for the operations of Port. The labor force employed during the construction phase will be provided potable water. The domestic waste water/sewage generated from the construction phase will be send to the septic tank followed by disposal to CMWSSB sewer line.

The major impacts on marine water quality are envisaged due to the proposed project like approach way, movement of construction equipment & materials etc will have a high potential to disperse the fine grained sediments in the water. As the proposed activity is strengthening of the existing structure the impact on water quality will be limited to construction phase only.

The runoff from the site containing construction materials, debris and construction waste and excavated earthen materials may have adverse impacts on the water environment especially on nearby marine water resources. Further the dispersion of fine sediment of runoff in the water during the construction activities can increase the particulate load in the neighboring aquatic habitat, which in turn can increase turbidity in and consequently affects the rate of the photosynthetic activity of the aquatic life.

However to the runoff will be limited to rainy days only and even this will be mitigated by proper planning by implementing the removal & strengthening of surface in non-monsoon months. Further RMC will be used for construction eliminating construction materials and all the construction debris will be stacked separately. Thus the impacts will be short term and minor. By implementing proper mitigation measures, adverse impact on water resources due to the turbidity will be minimized. Water conservation actions shall be taken during the construction phase by associated workforce & officials. Potential impact on ground water resources is not envisaged as there will not be any toxic material release in sub soil region having potential of ground water contamination.

Impacts due to Marine Water Quality:

In the present monitoring locations pH ranged from 7.56 to 7.97 and dissolved oxygen ranged from 5.8 to 5.9mg/l. Dissolved oxygen levels are not expected to reduce to anoxic conditions. The

activity is confined to existing berth for BD & JD berths. Under these circumstances, there is no possibility of any of the chemicals or metals being leached into the water.

d. Impacts due to noise levels:

- *Impacts due to Increase in Noise Levels*

The major sources of noise during construction phase are due to operation of various construction equipment's. Under the worst scenario, considered for prediction of noise levels during construction phase, it has been assumed that equipment required during construction phase is operating at a common point.

Table 5.4: Average Noise Levels generated by the operation of various construction equipment

Equipment	Noise Level (dB(A))
Batching Plant	90
Transit Mixer	75
Winch – 7.5 t capacity	75
Generator	85
Hydraulic Rig	85
Compressor	80
Wibro hammer	80
Concrete mixer	75
JCB-3D	85
Trailer	85
Excavator	80
Dumper	85
EoT Cranes	80
Ordinary Cranes	75

Impacts on noise on labour population:

The effect of high noise levels on the operating personnel, has to be considered as this may be particularly harmful. It is known that continuous exposures to high noise levels above 90dB(A) affects the hearing acuity of the workers/operators and hence, should be avoided. To prevent these effects, it has been recommended by Occupational Safety and Health Administration (OSHA) that the exposure period of affected persons be limited as below table.

Table 5.5: Maximum Exposure Periods specified by OSHA

Maximum equivalent continuous Noise Level dB(A)	Unprotected exposure period per day for 8hrs/day and 5 days/week
90	8
95	4
100	2
105	1
110	½
115	¼
120	No exposure permitted at or above this level

The noise levels during various construction activities have been compared to various standards prescribed by Occupational Safety and Health Administration (OSHA), which are being implemented under Factories Act.

The impacts due to noise of these equipment’s will be local and temporary as well as negligible due to the efficient implementation of proper mitigation measures like provision of Ear Protective Safety Equipment (ear plug & ear muff) for the personnel likely to be exposed to high noise level.

- The noise level of these machineries / equipment’s shall be minimized by proper lubrication, modernizations, maintenance, muffling and provision of silencers wherever possible.

- Further, construction activity would be carried out at daytime to prevent increase in noise level during night time.

The major effects of the noise due to the predicted sources will be limited to the workers exposed to the high noise area. Thus there would not be any considerable impacts on ecological factors as well as social layout.

The most efficient mitigation shall include provision of PPEs (Personnel Protective Equipment's) as well as planning of work hours and shift of workers as per applicable guidelines or NIOSH/OSHA guidelines.

e. Impacts on Biological Environment:

During the construction of any project the following activities are happening which directly or indirectly have some impact on the flora & fauna:

Transportation of heavy vehicles:

During the construction of project the transportation of heavy vehicle carrying the construction material will be done. It will generate increased dust, noise and light during movement. The dust will be settled on the nearby flora of the roads and adjoin area, and covering the leaf and hence reducing the photosynthetic activity.

Noise created due to increased traffic will have impact on the nearby fauna and as the area already developed the impact on fauna will be minimal and it is limited to construction period only.

Light during the night time due to increased vehicle will have impact. However there is no schedule –I fauna is present in the area, and it is temporary effect during construction phase and the impact will be negligible.

Impacts on terrestrial flora and fauna

There will be minimal impact on terrestrial flora and fauna as the activities proposed were strengthening of existing structures. The proposed activity is confined to existing port limits only.

There are no rare species of flora and fauna in Chennai Port area as well as at proposed sites. The project is not expected to bring about any major irreversible change in the terrestrial area as the proposed project is developed one and proposed activities will be as per land use of the area. It can therefore be concluded that the proposed project and its activities will not have any adverse impacts on the terrestrial flora and fauna of the core area or its buffer zone.

f. Impact on Solid & Hazardous Waste:

The other problem envisaged during construction phase could be the disposal of solid and hazardous waste. All construction derbies will be handled and used for filling of low lying areas and excess will be disposed as per applicable norms. Apart from this other waste materials like packaging, polythene or plastic materials, Waste oil etc will be segregated and disposed as per applicable norms. Hazardous wastes like waste oil, lubricant oil etc will disposed to authorized recyclers.

g. Impact on Land Environment:

Land use pattern of the surrounding area would not change as it already used for port activity with some open land/back-up area. The port has a total land area of 240ha and water spread area (basin) of 170ha. At present the site is almost devoid of natural vegetation, so major clearance of vegetation in site for development of proposed projects is not required. Hence, there would not be any adverse impacts on land cover is envisaged.

The construction activities like excavation for foundation, earth-filling, clearing, stripping, leveling the sites and vehicular movements will not entail changes in the landscape.

The construction waste may pose impacts on land environment will be minimal as the area is already having PCC surface and minor repairs i.e, strengthening of existing surface will be done. To minimize any accidental spillage of fuels and lubricant oils all vehicle will be serviced regularly and during breakdown steps will be taken to stop any accidental leakage of the fuel or lubricant oil.

Impacts during Operation Phase:

a) Entrainment of fugitive emissions:

The following cargo is proposed to be handled at the facilities being developed in the Chennai Port Trust:

- ❖ Bulk Cargo
- ❖ Container cargo

There will be no additional cargo to be handled in the proposed activity. The entire operation would be handled in closed covered system. Thus, no air pollution is envisaged.

b) Generation of Garbage at Port:

The other problem envisaged during operation phase could be the disposal of garbage. The solid waste in the proposed project could also be generated mainly from three sources viz., office waste, domestic waste and waste from cargo handling etc. Solid waste will be segregated and disposed as per applicable rules.

c) Environmental Impact from Ship traffic:

During the operational phase with additional facilities there will be no increase in ship movement in the region. However there will be change in cargo handling capacity in proposed activity from dusty cargo to clean / bulk cargo. This eliminate the possible impacts on marine environment. All ship wastes will be handled as per MARPOL.

d) Material Handling:

The present system of cargo handling through mechanized process. Further, the bulk handling is to be done in a phased manner to address environmental concerns. Hence, the proposed expansion and modernization is not expected to cause any significant adverse impacts.

e) Impacts due to noise on Project staff:

No adverse impacts on noise environment are anticipated due to the proposed project as the project is up gradation of existing facilities. During project operation phase, the major source of noise could be due to operation of various equipment. It is recommended that workers operating various equipment's during project operation phases are provided with PPE including ear plugs.

f) Impacts due to noise on fisheries:

There are very few studies on the impact of aquatic noise on the marine animals. The proposed projects falls within Chennai Port and there is no fishing activity in the harbor waters. Existing Fishing harbor entrance is about 2 km from Chennai port entrance. Hence there will be no impact on fishing activity.

g) Spillage of Solid Cargo:

The impact of accidental release of solid cargo, particularly during rough weather, can take place. During normal operations, spills are not anticipated, since all the operations are as per existing practices and are handled by trained manpower. However, the port operations may be hampered if the ship is damaged or the cargo goes overboard that could risk navigation. The escapement of bulks such as bulk cargo and container cargo during unloading is not expected to cause impact. To minimize the same all visiting ships will have to comply MARPOL convention and avoid discharges in the port basin. In case of any accidental spill / release into harbor water, the dispersion of waste will be controlled by shutting down the berth operations and deployment of teams for recovery. In harbor water the dispersion will be much slower than open sea since the tidal movement is very low. Hence there will be no major impact on marine ecology is anticipated on account of spillage of solid cargo.

h) Ships generated wastes:

The four basic categories of wastes generated by ships are as follows:

- Oily waste which usually consists of some oil mixed with larger quantities of sea water, but also fuel residues and sludges.

- Remains of noxious liquid substances carried in bulk in parcel tankers, dry bulk carriers or in portable containers
- Sewage generated from crew.
- Garbage originating from the crew, the maintenance of the ship, cargo etc.

The International Convention for the Prevention of Pollution from ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78) prohibit all ships from discharging wastes at sea which could result in pollution of the marine environment. MARPOL 73/78 applied to oil tankers, cruise ships, general cargo and container vessels, tugs, ferries and small pleasure craft.

MARPOL 73/78 requires that ships retain all the wastes on board until reaching port. However, certain wastes can be discharged under certain conditions such as the distance from shore, the type of waste and the condition of the waste. Plastics of any kind cannot be discharged anywhere. The vessels must be equipped with dedicated holding tanks for sewage and oily wastes and have the capacity to compact and storage garbage. All ships visiting the port will comply with MARPOL, hence impact due to ship waste can be eliminated.

During operation of dry dock facility in boat basin/timber pond there is use of paint, solvent and other hazardous chemical during maintenance of ships. This is will exclusively for coast guard ship & occasionally ChPT ships. As of now existing facilities are catering minor repairs and after up gradation these facilities will fasten the maintenance process. The possible wastes generated during operation of facility are:

S.No.	Description	Disposal
01	Waste Oil	To Authorized recyclers
02	Waste cotton	To TSDF for Incineration
03	Paint Sludge and discarded paints	To TSDF
04	Paint containers and drums	To vendors
05	Waste MS Scrap/cuttings	Selling to recyclers / agents
06	Sand	Reuse / TSDF

Biological Environment:*Impacts on Terrestrial flora and fauna:*

The proposed project would have negligible impact on natural vegetation, species diversity, food web index due to low category project and very limited number of species and natural vegetation present in the study area.

The proposed project does not cause any adverse impacts on the flora and fauna on Guindy National Park as the proposed activity is not having any additional cargo handling and change in cargo to non-dusty cargo.

Discharge of Oil & wastes from the ships into the sea:

Due to increased traffic movement in the port may increase the chances of increased spillage of oil and other wastes in the sea. During accidental spill, oil spreads on the water surface and makes a film over it reducing the dissolved oxygen level in the water. The oil and petroleum products are very injurious for the flora and fauna of the marine ecosystem. The. It may have very negative impact on the marine ecosystem including the fishes. In case of any spill all activities like fuelling etc will be shut down and existing oil spill contingency plan will be implemented. Hence, the solid wastes, sewage, oily ballast, bilge water and bunker fuel bottoms generated from ships should not be discharged directly and it should be discharged as per the norms of MARPOL.

Marine Flora and Fauna:

An increase in concentrations of dissolved PHc (Petroleum Hydro carbons) in water subsequent to a spill can lead to plankton kills. The recovery of plankton will be however quick through repopulation of the community by fresh recruits from adjacent areas not affected by oil. Eggs and larvae of fishes, crustaceans and mollusks which are highly sensitive to even low concentrations of PHc (10-100 µg/l) and aromatics (1-5µg/l) in particular will be severely affect. Fishes are sensitive to oil and tend to avoid petroleum. Often fishes get tainted and unpalatable but become normal when the ambient PHc level approaches the baseline which is expected within a few days. To mitigate the sample exiting disaster management plan will be implement to control any accidental spills.

Benthos:

These organisms have limited movements and hence are more vulnerable to oil spills. If the thick weathered oily mass spread on intertidal areas, immediate mortalities of organisms in the zones of physical contact are expected. Benthic organisms of sandy habitats will recover faster as compared to those of the muddy intertidal segments where oil might penetrate into subsurface layers through animal burrows and might remain there for decades due to very low natural weathering of oil in such sheltered habitats. Since the proposed project is in existing harbour water and where the depth is maintenance continuously the expected impact on benthic community will be minimal.

5.3.3 Impacts and Mitigation of activity -2

Table 5.6 Projects in Activity -2

S.No	Name of the Activity	Coding
4	Relocation of existing Sand Trap and Capital Dredging –change in location	Activity -2

a. Impacts Due to Relocation of Sand Trap:

The proposed activity is relocation of existing sand trap to south of Chennai port approach channel. As per studies conducted by CWPRS optimum size of the sand trap is which this dredging of 5,00,000 Cum. The potential environmental effects of dredging can be categorized as impacts due to dredging process and disposal of the dredged material. During the dredging process, adverse impacts are anticipated on account of excavation of sediments at the bed, loss of material during transport to the surface, overflow from the dredger whilst loading and loss of material from the dredger and/or pipelines during transport.

The evaluation of the environmental effects of dredging and disposal must take account of both the short-term and long-term effects that may occur both at the site of dredging or disposal (near filed) and the surrounding area (far field). Near filed effects are simply defined as ‘phenomena occurring within the geographic bounds of the activity, or less than approximately 1 km from the activity’, and far field effects as ‘occurring more than approximately 1 km from the activity’.

b. Impacts on Suspended Sediments and Turbidity levels:

When dredging and disposing of non-contaminated sediments, the key impacts are the increase in suspended sediments and turbidity levels. Any dredging method releases suspended sediments into the water column, during excavation itself and during the flow of sediments from hopper and barges. In many cases, locally increased suspended sediments and turbidity associated with dredging and disposal is obvious from the turbidity ‘plumes’ which may be seen trailing behind dredgers or disposal sites.

Increase in suspended sediments and turbidity levels and disposal operations may under certain conditions have adverse effects on marine animals and plants by reducing light penetration in to the water column and by physical disturbance.

Increased suspended sediments can affect young fish, if suspended sediments become trapped in their gills increased fatalities of young fish have been observed in highly turbid water. Adult fish are likely to move away from or avoid areas of high suspended solids, such as dredging sites, unless food supplies are increased as a result of increase in organic material. The increase in turbidity could marginally affect the fisheries in the area.

The degree of re-suspension of sediments and turbidity during dredging and disposal depends on:

- Sediments being dredged (size, density and quality of the material)
- Method of dredging (and disposal)
- Hydrodynamic regime in the dredging and disposal area (current direction and speed, mixing rate, tidal state) and
- Existing water quality and characteristics (background suspended sediment and turbidity levels)

c. Impacts due to dredging and disposal of organic matter and nutrients:

The release of organic rich sediments during dredging or disposal can result in the localized removal of oxygen from the surrounding water. Depending on the location and timing of dredging, this may lead to the suffocation of marine animals and plants within the localized area or may deter

migratory fish or mammals from passing through. However, removal of oxygen from the water is only temporary, as tidal exchange would quickly replenish the oxygen supply.

d. Impacts due to contaminated sediments:

Another possible impact is the release of toxicants from the sediment if the sediment is contaminated. In the case of contaminated sediment acute toxicity, chronic toxicity and bioaccumulation are the possible effects. But all these are short terms and insignificant and no serious effects have been reported from any earlier instances or experimental studies.

In various sampling locations covered as a part of the study, sediment samples analyzed did not show the presence of any appreciable levels of contamination and hence may not pose any such problems.

Impacts due to Marine Water Quality:

In the present monitoring locations pH ranged from 7.56 to 7.97 and dissolved oxygen ranged from 5.8 to 5.9mg/l. Dissolved oxygen levels are not expected to reduce to anoxic conditions. Under these circumstances, there is no possibility of any of the chemicals or metals being leached into the water. Moreover, sediment samples collected from all the sites were uncontaminated. The causes for low DO level need to be ascertained at the project site and suitable mitigation measures to be undertaken. As such no adverse impact due to dredging or dumping on the chemical characteristics of water or sediment is expected.

- **Impacts due to Increase in Noise Levels**

The major sources of noise during construction phase are due to operation of various construction equipment's. Under the worst scenario, considered for prediction of noise levels during construction phase, it has been assumed that equipment required during construction phase is operating at a common point.

Estimated noise levels for dredging operations at different distances from the source are given in below table. The day and night noise levels near the dredging sites of 100m and 200m from the source respectively. For workers within 100m, sound protection gears are recommended.

The residential colonies are located away from the dredging sites and hence shall not be subject any noise quality problems as a result of these operations.

Table 5.7: Estimated Noise levels for the dredging Operations

Distance from noise source location (m)	Predicted noise level Dredging	Noise Standards dB(A)	
		Day	Night
10	90.00	75	70
30	80.46		
50	76.02		
100	70.00		
200	64.00		
500	56.00		

Impact on Solid Waste:

Total Capital dredging envisaged is 5, 00,000 Cum for relocation of sand trap.

Impacts on Marine Ecology:

Impacts on benthos and fishes due to proposed projects

The proposed project site is within the limit of existing port where benthic diversity and abundance in the area is found to be low in comparison with other near-shore areas in the region. This is principally attributed to the fact that the area is surrounded by marine-based development projects related to the reconstruction and development of the Chennai Port. As per the baseline study, no rare species of flora and fauna have been identified in Chennai Port Bay.

The pre-project status of macro and meo-benthos within bay area indicate no rare species. The existing benthic fauna in the bay area will be disturbed and possibility of loss locally during the construction period however it will be temporary phenomena. Moreover, the sediment benthoses are expected to get re-established after completion of construction activities through natural siltation process.

The impact on fishes may be either due to physical impact of suspended solids or due to changes caused in the food chain. As the fishes are capable to freely move in water, they avoid areas with higher turbidity. They return to the area, once the turbidity reduces after the cessation of construction activities. The excess amount of sediments entrained as a result of placement of construction material in the water column results in fish suffocation as gill chambers become coated or clogged with material. Many researchers have concluded that extremely turbid water that is formed briefly during construction phase can be detrimental to fish, but the impacts are not very alarming.

The overall impact of the dredging activities on the marine micro flora and fauna would be of medium significance which after the implementation measures is expected to be low significance. Most fishermen fish in the sea beyond the port area, with only a small number fishing near the port harbor. Therefore the impact on fishing activity, specifically from dredging would be localized and primarily during construction phase. As the fishing in the impacted area is in small scale, impacts on overall fishing activity may be low, though impacts on the disruption of incomes of a small number of individual fishermen can be medium. Hence overall significance on fishing activity due to dredging will be marginal.

Mitigation measures

All necessary precautionary measures would be taken so as not to create localized turbulence during marine construction period leading to re-suspension of bottom sediment or apply geo-textile lining (temporarily) in the vicinity of construction area to prevent entrainment of silty sediment and to minimize turbidity related impacts.

Detailed inventory and mapping of movement of fishermen fishing within 500 m of the proposed project location, or crossing it to access their fishing locations prior to start of construction. A grievance mechanism shall be in place to respond to ongoing complaints and concerns of the fishermen; and support to the fishing community as part of CSR programme through their cooperative societies in project area.

Impacts During Operation Phase:

The proposed project will be effective to control sedimentation of sand and will not have any impact on the present conditions and the berths and terminal areas of the Chennai port as per CWPRS report (Refer Annexure IX).

5.3.4 Impacts and Mitigation of Activity - 3

Table 5.8 Projects under Activity -3

S.No	Name of the Activity	Coding
5	Development of coastal Terminal (1MTPA) at Northern sheltering arm at east of Bharathi Dock turning circle –New	Activity -3

Impacts During Construction Phase:

a) Impacts due to construction activity:

The proposed project involves construction of berth with deck slab, piling and hardening of backup area.

b) Impact on Air quality:

- *Emissions Sources during the construction phase:*

The proposed project will have no major considerable stress/pressure on the environment to give rise to any significant adverse impacts on environment. The only major impacts on air during construction phase are predicted to be caused due to air borne dust arising from the construction activities as well as gaseous pollutants from vehicles used for transportation of construction materials and emission from equipment used during construction phase. The dust particles in the form of particular matters will strongly depend on various activities like movement of vehicles, their speed, construction activity etc during the construction phase.

The probable sources of the dust are due to vehicular emissions, due to development of backup area and additional stocking area. These activity require leveling and preparation of ground for

strengthening work. The airborne fine particles may have significant impacts on environment. To control the fugitive emissions during construction phase ready mix concrete will be used. Few quantities of construction waste material will be generated and will be used to backfill the low lying areas and any excess will be handled as C&D rules 2016.

For control of the airborne particles from during construction RMC will be used and trucks used for construction material will be covered with taruplin. Only vehicles having PUC shall be allowed & well equipped handling & transportation facilities shall be provided throughout the construction phase. The construction area shall be isolated to control the dispersion of air particles into surrounding environment. DG sets with acoustic enclosure will be used during construction phase and stack height will be as per CPCB norms. The residual impacts of emission from the DG stack would not be significant to cause any considerable impacts on air.

The combustion of diesel in various construction equipment could be one of the possible sources of incremental air pollution during the construction phase. The quantum of diesel consumed is not high to cause any significant impact on ambient air quality.

The impacts on the environment generated during construction phase will be limited to the construction tenure and will be local. Hence looking to the overall facts described above, it can be concluded that the impacts on air due to the construction & erection activities will be minimum or negligible. It is also concluded that by implementing the proper mitigation measures, like sprinkling/wetting of project area with water will minimize the dust emissions including fugitive and by following other above mentioned controlled measures, the impacts will be almost eliminated or minimized to the lowest extent of damage.

- *Impacts due to transportation of construction materials:*

Vehicular movement from the transportation of construction material in the area is likely to increase temporarily during the construction period. The increase in number of trucks carrying construction material is expected to be in the range of 20-30 per day. The increased vehicular traffic is not expected to cause any significant impact on ambient air quality. However, it is a common practice that many a times, the trucks carrying construction materials are plying uncovered, leading to generation of emissions as they travel. These activities lead to be generation

of fugitive emissions. However, impact on this account is not expected to be significant and is likely to effect a small strip along both the sides of road network, over which the trucks carrying construction materials are plying.

- *Impacts due to operation of construction equipment:*

The major pollutant in the construction phase is SPM being air-borne due to various construction activities. The vehicular movement generates pollutants such as NO_x, CO and HC. But, the vehicular pollution is not expected to lead to any major impacts.

The soils in the project area are sandy in texture, and are likely to generate substantial quantities of dust. However, the fugitive emissions generated due to vehicular movement are not expected as the approach roads are paved ones and only backup area, additional stocking area will be exposed. This will be confined to short interval during construction phase only. Frequent wetting and isolation of the paving area will eliminate the generation of emission of dust. Use of RMC for construction will eliminate the emission due to construction material. The combustion of diesel in various construction equipment could be one of the possible sources of incremental air pollution during the construction phase.

c. Impact on Water Environment:

Port is drawing water from CMWSSB for the operations of Port. The labor force employed during the construction phase will be provided potable water. The domestic waste water/sewage generated from the construction phase will be send to the septic tank which finally discharge in to sewer lines of the Chennai Municipal Corporation for treatment and disposal.

The major impacts on marine water quality are envisaged due to the proposed project like approach way, movement of construction equipment & materials etc will have a high potential to disperse the fine grained sediments in the water, thus increasing the particular load which in turn can adversely influence the photosynthetic activity further affecting the marine life. However this rise in turbidity will be only during the construction phase. However it is to notice that this rise in turbidity will be only during the construction phase and the incidence of turbidity will be minimal due to prevention of any runoff from site. Thus the impacts will be short term and minor. By implementing proper mitigation measures, adverse impact on water resources due to the

turbidity will be minimized. Water conservation actions shall be taken during the construction phase by associated workforce & officials. Potential impact on ground water resources is not envisaged as there will not be any toxic material release in sub soil region having potential of ground water contamination.

Impacts on Marine Water Quality:

In the present monitoring locations pH ranged from 7.56 to 7.97 and dissolved oxygen ranged from 5.8 to 5.9mg/l. Dissolved oxygen levels are not expected to reduce to anoxic conditions. Under these circumstances, there is no possibility of any of the chemicals or metals being leached into the water. There will be temporary rise in turbidity levels during piling activity which will diminished with progress of work. Sources of noise during construction phase are due to operation of various construction equipment's. Under the worst scenario, considered for prediction of noise levels during construction phase, it has been assumed that equipment required during construction phase is operating at a common point.

Table 5.9: Average Noise Levels generated by the operation of various construction equipment:

Equipment	Noise Level (dB(A))
Batching Plant	90
Transit Mixer	75
Winch – 7.5 t capacity	75
Generator	85
Hydraulic Rig	85
Compressor	80
Wibro hammer	80
Concrete mixer	75
JCB-3D	85
Trailor	85
Excavator	80
Dumper	85

EoT Cranes	80
Ordinary Cranes	75

Impacts on noise on labour population:

The effect of high noise levels on the operating personnel, has to be considered as this may be particularly harmful. It is known that continuous exposures to high noise levels above 90dB(A) affects the hearing acuity of the workers/operators and hence, should be avoided. To prevent these effects, it has been recommended by Occupational Safety and Health Administration (OSHA) that the exposure period of affected persons be limited as below table:

Table 5.10: Maximum Exposure Periods specified by OSHA

Maximum equivalent continuous Noise Level dB(A)	Unprotected exposure period per day for 8hrs/day and 5 days/week
90	8
95	4
100	2
105	1
110	½
115	¼
120	No exposure permitted at or above this level

The noise levels during various construction activities have been compared to various standards prescribed by Occupational Safety and Health Administration (OSHA), which are being implemented under Factories Act.

The impacts due to noise of these equipment’s will be local and temporary as well as negligible due to the efficient implementation of proper mitigation measures like provision of Ear Protective Safety Equipment (ear plug & ear muff) for the personnel likely to be exposed to high noise level.

- The noise level of these machineries/ equipment's shall be minimized by proper lubrication, modernizations, maintenance, muffling and provision of silencers wherever possible.
- Further, construction activity would be carried out at daytime to prevent increase in noise level during night time.

There is no considerable habitat of fauna in vicinity of the project site. The major effects of the noise due to the predicted sources will be limited to the workers exposed to the high noise area. Thus there would not be any considerable impacts on ecological factors as well as social layout.

The most efficient mitigation shall include provision of PPEs (Personnel Protective Equipments) as well as planning of work hours and shift of workers as per Factory Act or NIOSH/OSHA guidelines.

h. Impacts on Biological Environment:

During the construction of any project the following activities are happening which directly or indirectly have some impact on the flora & fauna:

- *Transportation of heavy vehicles:*

During the construction of project the transportation of heavy vehicle carrying the construction material will be done. It will generate increased dust, noise and light during movement. Noise created due to increased traffic will have impact on the nearby fauna, it may have impact on the wild nocturnal animals. However it will have temporary impact during the construction period only.

Light during the night time due to increased vehicle will have minimal impact as the location is devoid to terrestrial fauna. Because there is no schedule –I fauna is present in the area, and it is temporary effect the impact will negligible.

- *Impacts on terrestrial flora and fauna*

There are no rare species of flora and fauna in Chennai Port area as well as at proposed sites. The disturbance by the direct impacts of the jack-up rigs/steel pile driving may lead to loss of benthos

(purely temporary). The increased turbidity could reduce light penetration at dredging/marine construction site, cause reduction in photosynthetic species. The envisaged low littoral drift in high tide periods would have negligible impact on mangrove ecology at more than 10 km distance from project site.

It can therefore be concluded that the proposed project and its activities will not have any adverse impacts on the terrestrial flora and fauna of the core area or its buffer zone.

i. Impact on Solid & Hazardous Waste:

The other problem envisaged during construction phase could be the disposal of solid and hazardous waste. This could comprise construction material, packaging, polythene or plastic materials, Waste oil. The waste that is generated during the construction phase will be disposed scientifically.

j. Impact on Land Environment:

Land use pattern of the surrounding area would not change as it already used for port activity with some open land/back-up area. The proposed activity will be hardening , development of existing port land for storing and handling of coastal cargo. This will not change the land use and the impact on land environment will be minimal to nil. At present the site is almost devoid of vegetation, so major clearance of vegetation in site for development of proposed projects is not required. Hence, there would not be any adverse impacts on land cover is envisaged.

The construction activities like excavation for hardening of the stocking area and vehicular movements will entail changes in the landscape, which are expected to be of short duration and not much significant.

The construction waste may pose impacts on land environment by contamination of soil and hence the wastes shall be utilized for PCC works, Road construction and other filling requirement etc the accidental spillage of fuels and lubricants oils will be minimized by proper care. Since this phase is temporary impact is marginally negative and short.

Impacts Due to Piling Activity:

During the construction of coastal terminal at northern sheltering arm, piling will be done with open type piled wharf structure of 260m x 16m to 19.5m in front of the Northern Sheltering arm of break water at south east corner of Bharathi dock turning basin. During the piling the sea water quality will be impacted and hence giving impact on the primary productivity of the sea. The impact will be temporary during the construction period only and it is in the area where already ship movement is going on and hence negligible impact anticipated.

Impacts Due to Dredging:

The total quantity of dredged material likely to be generated in the proposed project has been estimated as 7,500 Cum. The potential environmental effects of dredging can be categorized as impacts due to dredging process itself and those due to disposal of the dredged material. During the dredging process, adverse impacts are anticipated on account of excavation of sediments at the bed, loss of material during transport to the surface, overflow from the dredger whilst loading and loss of material from the dredger and/or pipelines during transport.

The evaluation of the environmental effects of dredging and disposal must take account of both the short-term and long-term effects that may occur both at the site of dredging or disposal (near filed) and the surrounding area (far field). Near filed effects are simply defined as ‘phenomena occurring within the geographic bounds of the activity, or less than approximately 1 km from the activity’, and far field effects as ‘occurring more than approximately 1 km from the activity’. As the quantity of the volume is less the impact will be minimal

b. Impacts on Suspended Sediments and Turbidity levels:

When dredging and disposing of non-contaminated sediments, the key impacts are the increase in suspended sediments and turbidity levels. Any dredging method releases suspended sediments into the water column, during excavation itself and during the flow of sediments from hopper and barges. In many cases, locally increased suspended sediments and turbidity associated with dredging and disposal is obvious from the turbidity ‘plumes’ which may be seen trailing behind dredgers or disposal sites.

Increase in suspended sediments and turbidity levels and disposal operations may under certain conditions have adverse effects on marine animals and plants by reducing light penetration in to the water column and by physical disturbance.

The degree of re-suspension of sediments and turbidity during dredging and disposal depends on:

- Sediments being dredged (size, density and quality of the material)
- Method of dredging (and disposal)
- Hydrodynamic regime in the dredging and disposal area (current direction and speed, mixing rate, tidal state) and
- Existing water quality and characteristics (background suspended sediment and turbidity levels)

As the total volume of dredging and is for during foundation of pile the impact on marine quality will be minimal.

c. Impacts due to dredging and disposal of organic matter and nutrients:

The release of organic rich sediments during dredging or disposal can result in the localized removal of oxygen from the surrounding water. Depending on the location and timing of dredging, this may lead to the suffocation of marine animals and plants within the localized area or may deter migratory fish or mammals from passing through. However, removal of oxygen from the water is only temporary, as tidal exchange would quickly replenish the oxygen supply.

d. Impacts due to contaminated sediments:

Another possible impact is the release of toxicants from the sediment if the sediment is contaminated. In the case of contaminated sediment acute toxicity, chronic toxicity and bioaccumulation are the possible effects. But all these are short terms and insignificant and no serious effects have been reported from any earlier instances or experimental studies.

In various sampling locations covered as a part of the study, sediment samples analyzed did not show the presence of any appreciable levels of contamination and hence may not pose any such problems.

Impacts due to Marine Water Quality:

In the present monitoring locations pH ranged from 7.56 to 7.97 and dissolved oxygen ranged from 5.8 to 5.9mg/l. Dissolved oxygen levels are not expected to reduce to anoxic conditions. Under these circumstances, there is no possibility of any of the chemicals or metals being leached into the water. Moreover, sediment samples collected from all the sites were uncontaminated. The causes for low DO level need to be ascertained at the project site and suitable mitigation measures to be undertaken. As such no adverse impact due to dredging or dumping on the chemical characteristics of water or sediment is expected.

Impacts on Marine Ecology:**Impacts on benthos and fishes due to proposed projects**

The proposed project site is within the limit of existing port where benthic diversity and abundance in the area is found to be low in comparison with other near-shore areas in the region. This is principally attributed to the fact that the area is surrounded by marine-based development projects related to the reconstruction and development of the Chennai Port. As per the baseline study, no rare species of flora and fauna have been identified in Chennai Port Bay.

The pre-project status of macro and meo-benthos within bay area indicate no rare species. The existing benthic fauna in the bay area will be disturbed and possibility of loss locally during the construction period however it will be temporary phenomena. Moreover, the sediment benthoses are expected to get re-established after completion of construction activities through natural siltation process.

The impact on fishes may be either due to physical impact of suspended solids or due to changes caused in the food chain. As the fishes are capable to freely move in water, they avoid areas with higher turbidity. They return to the area, once the turbidity reduces after the cessation of construction activities. The excess amount of sediments entrained as a result of placement of construction material in the water column results in fish suffocation as gill chambers become coated or clogged with material. Many researchers have concluded that extremely turbid water that is formed briefly during construction phase can be detrimental to fish, but the impacts are not very alarming.

The overall impact of the dredging activities on the marine micro flora and fauna would be of medium significance which after the implementation measures is expected to be low significance. Most fishermen fish in the sea beyond the port area, with only a small number fishing near the port harbor. Therefore the impact on fishing activity, specifically from dredging would be localized and primarily during construction phase. As the fishing in the impacted area is in small scale, impacts on overall fishing activity may be low, though impacts on the disruption of incomes of a small number of individual fishermen can be medium. Hence overall significance on fishing activity due to dredging will be marginal.

Mitigation measures

All necessary precautionary measures would be taken so as not to create localized turbulence during marine construction period leading to re-suspension of bottom sediment or apply geo-textile lining (temporarily) in the vicinity of construction area to prevent entrainment of silty sediment and to minimize turbidity related impacts.

Detailed inventory and mapping of movement of fishermen fishing within 500 m of the proposed project location, or crossing it to access their fishing locations prior to start of construction. A grievance mechanism shall be in place to respond to ongoing complaints and concerns of the fishermen; and support to the fishing community as part of CSR programme through their cooperative societies in project area.

Impacts During Operation Phase:**c) Entrainment of fugitive emissions:**

The following cargo is proposed to be handled at the facilities being developed in the Chennai Port Trust:

- ❖ Bulk Cargo
- ❖ Container cargo

The cargo to be handled in proposed port will not generate significant amount of fugitive emission. The entire operation would be handled in closed conveyor system. Thus, negligible air pollution is envisaged.

d) Generation of Garbage at Port:

The other problem envisaged during operation phase could be the disposal of garbage. This could comprise floating materials, packaging, polythene or plastic materials. Garbage accumulated on the deck is also problematic and should be suitably disposed. The solid waste in the proposed project could also be generated mainly from three sources viz., office waste, domestic waste and waste from cargo handling etc.

The office waste in the proposed project could be in the form of packing material, cardboard, etc which is not expected to be significant. The same is proposed to be routinely collected and are disposed as per the prescribed Municipal Solid waste (MSW) Rules.

e) Environmental Impact from Ship traffic:

During the operational phase with additional facilities there will be increased activities of ship movement in the region. All these activities may have impacts on marine lives. Possible sources of such impacts on marine environment would be from:

- Accidental Oil Spill from the calling ships
- Ballast Water
- Illegal tank washing
- Ship grounding, physical damage of bottom community
- Anchoring
- Discharges of sewage from vessels
- Discharge from solid waste

Ship traffic poses a risk of oil pollution from the following sources:

- Small spills caused by the accidental or intentional release of oil-contaminated bilge water from freights
- Minor spills caused by release of bunker oil during terminal operations

- Major spills caused by the rupture of a bunker oil tank in a bulk/cargo vessel collision, ship wreck of a bulk/cargo vessel

Marine environmental implications during routine operations at the harbor could be due to the following cases.

- Escapement of cargo during loading/unloading operations
- Release of wastes generated from the ships including garbage, solid waste, oily ballast and bilge water as well sewage.
- Wastes generated at the port Terminal such as domestic wastewater, effluent from grit/oil separator and garbage.

f) Material Handling:

The present system of cargo handling through mechanized process. Further, the bulk handling is to be done in a phased manner to address environmental concerns. Hence, the proposed expansion and modernization is not expected to cause any significant adverse impacts and will be beneficial for the environment.

g) Impacts due to noise on Project staff:

No adverse impacts on noise environment are anticipated due to the proposed project. During construction phase, there could be high noise levels due to operation of various construction equipments. Fitting of exhaust mufflers and intake mufflers could reduce the noise from air compressors. It is very useful for reducing the low frequency noise levels.

During project operation phase, the major source of noise could be due to operation of various equipment. As a part of the environment protection activities, trees and ornamental horticultural trees and shrubs have been developed around the project area, which will attenuate noise levels to a certain extent. It is recommended that workers operating various equipments during project construction and operation phases are provided with ear plugs.

h) Impacts due to noise on fisheries:

There are very few studies on the impact of aquatic noise on the marine animals. The marine animals can sense the noise in the infrasonic range between 5 and 35 cycles/second which is much different from the human audible range (20-20,000 cycles/second). Most of the work on noise pollution has been done in the audible frequencies. However, US Navy have done some work on the detection of submarines through the movement of Dolphins and fish species.

Noise generated by ship movement may interfere with their communication lines. It has been reported that ship movement may scare some of the fishes and their immediate reaction is restricted to avoid the area. However, as soon as the ship passes the area, they return. Therefore, it is apparent that the impact of ship movement on noise levels is purely temporary and may cause only marginal impact on the marine fauna especially fish. Quantification of such impact is not possible.

i) Spillage of Solid Cargo:

The impact of accidental release of solid cargo, particularly during rough weather, can take place. However, it would have limited impact on the environment. However, the port operations may be hampered if the ship is damaged or the cargo goes overboard that could risk navigation. The escapement of bulks such as bulk cargo and container cargo during unloading is not expected to cause any serious impact, as they are non-toxic. Thus, no major impact on marine ecology is anticipated on account of spillage of solid cargo.

j) Ships generated wastes:

The four basic categories of wastes generated by ships are as follows:

- Oily waste which usually consists of some oil mixed with larger quantities of sea water, but also fuel residues and sludges.
- Remains of noxious liquid substances carried in bulk in parcel tankers, dry bulk carriers or in portable containers
- Sewage generated from crew.
- Garbage originating from the crew, the maintenance of the ship, cargo etc.

The International Convention for the Prevention of Pollution from ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78) prohibit all ships from discharging wastes at sea which could result in pollution of the marine environment. MARPOL 73/78 applied to oil tankers, cruise ships, general cargo and container vessels, tugs, ferries and small pleasure craft.

MARPOL 73/78 requires that ships retain all the wastes on board until reaching port. However, certain wastes can be discharged under certain conditions such as the distance from shore, the type of waste and the condition of the waste. Plastics of any kind cannot be discharged anywhere. The vessels must be equipped with dedicated holding tanks for sewage and oily wastes and have the capacity to compact and storage garbage.

Biological Environment:*Impacts on Terrestrial flora and fauna:*

The proposed project would have negligible impact on natural vegetation, species diversity, food web index due to low category project and very limited number of species and natural vegetation present in the study area.

The proposed project does not cause any adverse impacts on the flora and fauna at about 9.5 km Guindy National Park.

Discharge of Oil & wastes from the ships into the sea:

Due to increased traffic movement in the creek may increase the chances of increased spillage of oil and other wastes in the sea. The oil and petroleum products are very injurious for the flora and fauna of the marine ecosystem. The oil spreads on the water surface and makes a film over it reducing the dissolved oxygen level in the water. It may have very negative impact on the marine ecosystem including the fishes. Hence, the solid wastes, sewage, oily ballast, bilge water and bunker fuel bottoms generated from ships should not be discharged directly and it should be discharged as per the norms of MARPOL.

Effect of Crude oil spillage:

Small spills will have a temporary and limited adverse impact on the pelagic and intertidal marine biota. The impact however might be severe in case of large spills. The residue transported to the shore will contaminate the sub tidal and intertidal benthic habitats of about 1 to 4 km coastal length

depending on the quantity of residue. Hence, the benthic fauna of these areas will suffer accordingly.

Zooplankton:

An increase in concentrations of dissolved PHc (Petroleum Hydro carbons) in water subsequent to a spill can lead to plankton kills. The recovery of plankton will be however quick through repopulation of the community by fresh recruits from adjacent areas not affected by oil. Eggs and larvae of fishes, crustaceans and mollusks which are highly sensitive to even low concentrations of PHc (10-100 µg/l) and aromatics (1-5µg/l) in particular will be severely affected. However, it is unlikely that any localized losses of fish eggs and larvae caused by a spill will have discernible effect on the size or health of future adult populations.

Benthos:

These organisms have limited movements and hence are more vulnerable to oil spills. If the thick weathered oily mass spread on intertidal areas, immediate mortalities of organisms in the zones of physical contact are expected. Subtidal benthos of shallow waters might also be killed or tainted if the sinking residue affects their habitats. Benthic organisms of sandy habitats will recover faster as compared to those of the muddy intertidal segments where oil might penetrate into subsurface layers through animal burrows and might remain there for decades due to very low natural weathering of oil in such sheltered habitats.

Fishes:

A large oil spill can temporarily reduce the fish catch from the area as fish might migrate from the affected zone. Limited mortality may also occur particularly when the oil concentrations in water go abnormally high. Fishes are sensitive to oil and tend to avoid petroleum. Fishes are sensitive to oil and tend to avoid petroleum. Often fishes get tainted and unpalatable but become normal when the ambient PHc level approaches the baseline which is expected within a few days. Local fishermen may get affected by getting either contaminated fishes/crabs/larvae etc or poor catch but temporary.

5.3.5 Impacts & Mitigation of Activity -4

Table 5.12 Projects under Activity -4

S.No	Name of the Activity	Coding
6	Development of Storage sheds and tank farms as per the land use plan of the Chennai port –new	Activity -4
7	Development of Multilevel car parking facility (5000cars –New)	

For Activity 6 (Tank Farm & Storage Shed) :

The area clearly demarcated and developed one. The site is within port limits and connected with service roads connected to existing road network facility via Jawahar Dock.

Environmental Aspects of Construction operations:

Major environmental concerns related to construction activities are:

- Loading and Unloading of Construction of Materials including structural for creating tank farm.
- Vehicular Movement for RCC, trucks for material shifting and manpower.
- The area demarcated is developed one and no overburden or debris found.
- The proposed development is surrounded by Sea on eastern side , Marshalling Yard on western and southern side and Jawahar Dock northern side.

Air Environment:

Causes for Air Pollution

- ❖ During Construction Stage –

The construction activities will change the quality of air in the surrounding environment of the project site. In this project the activities involves is construction of storage sheds and Tank farms with transportation, operation of DG sets and operation of batch mixing plants and will not involve excavation and leveling. The nature and extent of impact on air environment will vary from time to time, location to location and through different stages of development of the project. There will be increase in levels of Particulate matter and NOx levels. Vehicular movement is the major sources that can create impact in the air environment.

Mitigation Measures:

- Barricading should be done along the sea side for arresting accidental spills/debris enter into sea during construction activity.
- The vehicles carrying the dusty materials will be covered with tarpaulin.
- Vehicles with pollution under certificate will be used for construction activity.
- Isolation of construction area with flexible enclosures/curtains so that the emitted air will not spread in the surroundings.
- Various noise generating operations like hammering, piling should follow OSHA guideliness, so as to minimize noise levels.
- However where noise levels cannot be avoided there workers should use proper PPE and limit working hours based of source dB(A). (As per factories act).
- During fabrication/construction by mobile dust catchers shall be deployed to control fugitive dust arises during various operations.
- Any short blasting and painting operations if any should be equipped with bag filter/scrubbing systems.

❖ During Operation Stage-

Impact on air environment during operational phase of the proposed project is mainly due to vehicular emissions and also emissions from the operation of DG sets, which are used as an alternate source of power supply during the emergencies of power failure.

Mitigation Measures:

- Using low sulphur fuel for vehicles and existing DG sets.
- Motor able roads in the complex shall be maintained to reduce dust emission.
- Ensure operational procedures are adequately implemented and regularly reviewed so as to identify opportunities for continual improvement.
- Green belt development as per master plan of port helps to minimize the buildup of pollution levels in urban areas by acting as pollution sinks.

Water Environment:

The proposed project requires water for construction and domestic purpose only and the site is connected with existing water supply lines of Chennai port. During operation phase firewater line of Chennai port will be extended to the proposed facility.

Causes for Water Pollution

❖ During Construction Stage-

During construction phase water will be used for suppression of fugitive dust and for domestic purpose only.

Mitigation Measures:

- Provision of temporary toilets for construction workers
- Use of mist gun/water spray control fugitive dust.
- For curing of concrete use pads / gunny bags to keep the structure wet instead of pouring water.
- Excavation can be avoided during monsoon season.
- Runoff from the construction site shall not be allowed to stand or enter into the roadside or nearby drain. Adequate measures like construction of small pits with baffle walls will act as primary treatment and allows clear water out side of construction area during heavy rains.
- The construction equipment like miller, vibrators, generators and pumps used for construction activity will be stored in a pre-demarcated area and fuels, like oils and greases should store in elevated/pucca platform to minimize accidental spills/ leakages entering into atmosphere.

❖ During Operation Stage-

Probable impact on water resources in the operational phase will be mainly due to discharge of domestic sewage generated during the functional phase of the building. All these liquid waste generated will be treated and disposed to the sewer lines connected to CMWSSB.

Mitigation Measures:

- Storm water management plan will be prepared to avoid the contamination of storm water runoff.

Noise Environment:*Causes for Noise Pollution*

❖ During Construction Stage

The main sources of noise pollution during construction phase are pulverization, drilling, welding and other activities using machineries. Vibrations will be caused by dumpers, bulk careers and machineries. There will be increase in ambient noise level. Other than construction equipment's, vehicles play an important role in changing the ambient noise levels. It will affect the workers, patients, students and others in and around the project area.

Mitigation Measures:

- All the workers should be provided with ear muffs and ear plugs.
- All the construction equipment's and machineries should be kept in good condition so that it will not make much noise that can change the ambient noise level.
- Construction activities which produce noise should not be carried out in day time.

Land Environment:

During construction phase there will be generation of construction debris, excavated soil etc.

Mitigation Measures:

- During construction phase construction debris will be back filled, filling of low lying areas or handled as per C&D 2016 rules.

❖ During Operational Phase-

The impact on noise during the functional phase of the project will be due to vehicular traffic and use of DG sets as a backup facility.

Mitigation Measures

- Proper and suitable acoustic barrier will also be provided around areas generating high noise.
- DG sets will also be housed in acoustically treated room so that the ambient noise level will not get affected.
- Green belt development will reduce noise.

Land Environment:

The proposed project will be established with in the developed port area and the land is presently vacant and devoid of vegetation.

There will not be any emissions/ spills directly onto land because the area will be paved and above mitigation measures in terms of water pollution are holds good.

Ecological Environment:

❖ During Construction Phase-

During construction phase due to emission of fugitive dust emission will be cause impact on ecological environment. To minimize the impact precautions like barricading, sprinkling of water etc. will be under taken to minimize the impact.

Solid Waste

Causes for Solid Waste

Day to day activities will cause the generation of solid waste from the proposed project, which is mainly a municipal solid waste which includes garbage, paper, plastic, wood etc.

Table 5.13: Solid Waste Details

Stage	Types of Wastes	Disposal
Construction	Debris/construction wastes	Backfilling / disposal as per C&D Rules,2016
	Packing Material	Segregation and disposal to CMC dump yard.
	Empty drums and carboys	To authorized vendors
	Spillage of fuels/construction	Proper storage and handling
	Wastes from Vehicle and equipment maintenance like waste oils, cleaning solvents, used batteries, used tyres	Waste oils, used batteries, used tyres etc will be disposed to authorized recyclers.
Occupation	Garbage	Source segregated and disposed to municipal dump yard.
	Used oils and batteries	Disposal to authorized recyclers.
	Spills and leakages	Installation of Oil water separator for treatment of any accidental spills.

Overall Socio-economic Environment:

This project would bring positive impacts on the socio-economic front.

No R& R. only beneficial impacts due to increased employment, transport etc, and overall economy of the area.

Impact during construction Phase:

Due to the proposed project a significantly higher affirmative changes in the socio-economic quality is foreseen, beneficial impacts of proposed project on socio-economic layout of project area would start its occurrence from construction phase itself. Significant opportunity of direct & indirect employment and upliftment of the economic status of the area will be major affirmative impact of the proposed projects. Besides, the adverse impacts on socioeconomics are not envisaged during the construction phase. Contractor will employ local people in the construction phase to meet the significant human resource requirement for construction works so that the locals would get opportunities for employment. Beside this, the local population would also get opportunities in related services activities like small contractors, sub contractors, supply of construction materials, supply of basic facilities like eatables to the site etc. The construction activities will generate lot of employment in the ancillary activities.

The project area is well connected with road networks and hence issues of traffic and transport infrastructure issues are not envisaged. However, the minor impacts of vehicular noise is envisaged which will be mitigated by avoiding night transport activities. Even some high noise generating construction activities will also be conducted in daytime only.

Thus looking to the overall facts and details, it has been envisaged that the construction phase of proposed project would not pose any adverse impacts on socio-economic layout of project area but will have significant beneficial impacts due to increased direct & indirect employment for construction works.

Impacts During Operation Phase:

Similar to the construction phase, the operation phase will provide significant opportunities for employment in skilled, semi skilled & unskilled categories indirectly. This would multiply economic opportunities, and henceforth enhance the livelihood patterns of this region. Amenities like fresh water for port complex, transportation facility, green belt etc would positively enhance the infrastructure. Maximum of the human resource requirement will be met by local employment.

Thus the proposed project would considerably be beneficial to the socioeconomic conditions of local area.

Welfare activities along with employment done by project proponent will improve the socio-economical condition as well status of health & education in the region.

Thus looking to the overall scenario of activities & probable impacts of the proposed projects, it has been envisaged that there will be an overall improvement in socio-economic layout of project area will be the key benefits of the proposed projects. The adverse impacts will be almost none during the operation phase of project.

The proposed Chennai Port project will result in minimal adverse impact on the socio economic environment. Assuming that mitigation measures are incorporated to minimize potential adverse

The resulting terms for the overall assessment for each socio economic environment aspect were defined as follows:

High: impact acceptable if any criterion is awarded as high grade.

Medium: tolerable risk/ impact not acceptable if managed to level that is As low As reasonably practicable, if the criteria have grades combining medium & low; and

Low: negligible risk/impact acceptable than all criteria are low.

5.4 Rain water harvesting:

Rainwater harvesting is primary tool to minimize the impact of urbanization on ground water. Chennai Port Trust is having approximately 121 Rain Water Harvesting pits in its existing facility and will be maintained.

5.5: Pollution Control Measures:

Chennai Port Trust is procuring One Fogging machine, dust sweeping machine during 2017-18 financial year to control fugitive and road dust. A part from this ChPT has been developing green belt to control dust emissions.