INLAND WATERWAYS AUTHORITY OF INDIA

Ministry of Shipping, Government of India

"CAPACITY AUGMENTATION OF NATIONAL WATERWAY.1"

(Jal Marg Vikas Project)

ENVIRONMENTAL IMPACT ASSESSMENT REPORTS

VOLUME - 4:
Environmental Management Plan (EMP) for Varanasi Terminal

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Chapter 1. EMP FOR VARANASI TERMINAL

1.1. Introduction

Inland waterways Authority of India (IWAI) has proposed to augment the navigation capacity of waterway NW-1 (Haldia to Allahabad) and continue to maintain the entire stretch. Under this project, IWAI has proposed to develop the infrastructure facility like Multimodal terminals, Navigation aids for day & night navigation, River information system with all hardware and software, Ro-Ro jetties, Bank & slope protection, River training works, Equipment like tow barges, inland vessels, survey vessels including rescue boats & survey equipment and Dredging of the navigation channel, to augment the navigation capacity of the waterway.

A Multimodal inland water terminal at Varanasi is proposed under this project to enhance the navigation facility of the NW-1. Proposed terminal site abuts River Ganga and is located near village Ralhupur, Ramnagar, Varanasi, Uttar Pradesh. Location map of the project is given in **Figure 1.1** below.

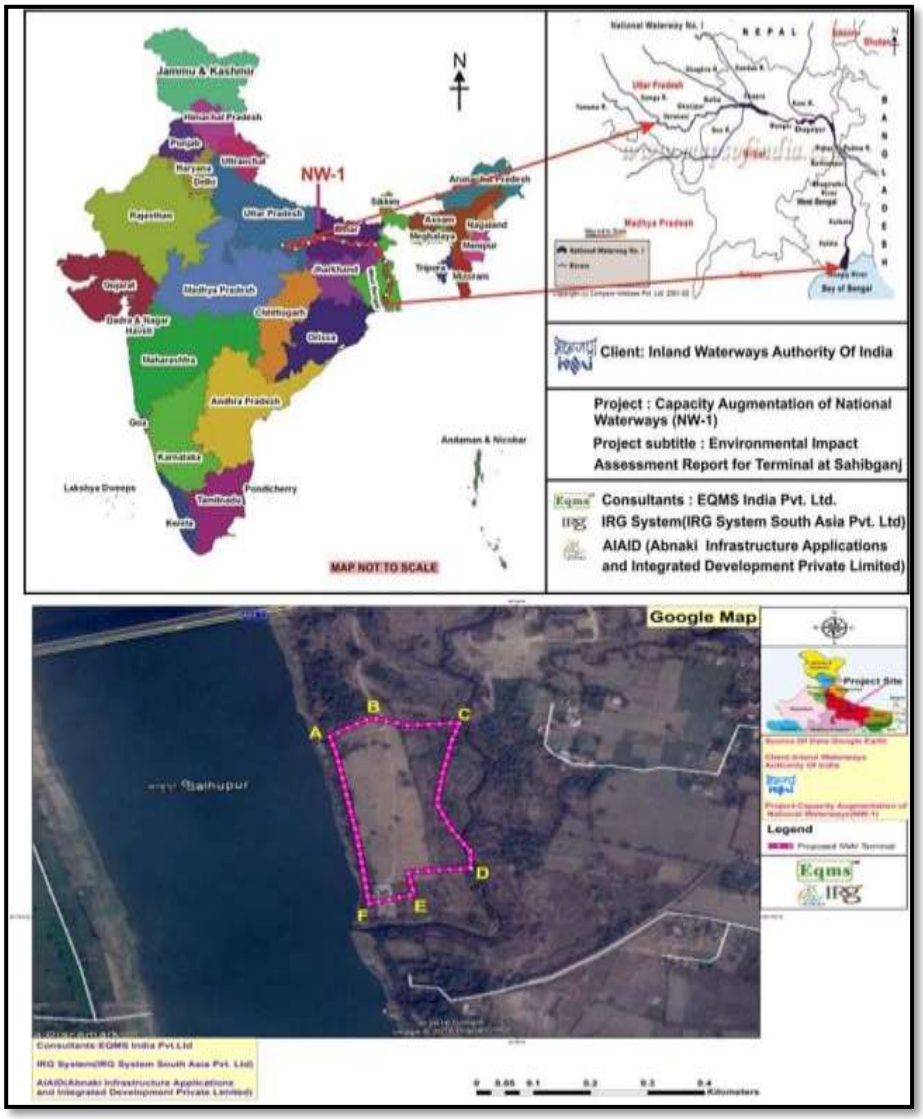

Figure 1.1 : Location Map

1.2. Brief on Varanasi Terminal

The Varanasi terminal is proposed to be developed as a multimodal terminal facility. The terminal site is agricultural land at present with land cover comprising of crops, mango orchards and few settlements. Site is flat land with elevation variation from RL +74-77m. Finished level of site achieved after cut & fill will be RL +75 which is more than the highest flood level, i.e. RL +74

As per planning this terminal will be connected to rest of the city vide roads and railways both. At present site is connected by a village road. Approach road of 1 km length will be constructed to connect terminal site to NH-7. Railway siding will be constructed to provide connectivity to terminal site with the EDFC. Internal road of 12 m width will be developed within the terminal to facilitate smooth movement. In the phase 1 the terminal shall handle about 0.54 MTPA (million metric tones per annum) or 1636 TPD. Material to be handled will be coal, cement, stone chips, and fertilizer and food grains etc. Capacity will be enhanced to 1.22 MTPA by 2038. Onshore facilities for phase 1 include unloading/loading areas, internal roads, administration buildings, substation building, toilet block, fuel bunker, security office, weigh bridge building, lighting tower and other allied services sewerage management system, drainage system, fire-fighting facilities, communication system, water supply & power supply (ESS); Boundary wall, Green belt and Approach Road (1 km connecting to NH-7.

Off-shore facilities for phase 1 include construction of berth of 200 m length & 35 m width, Water area & approach channel and Shore protection (117 m upstream of terminal and 35 m downstream of terminal).

1.3. Description of Environment

The baseline environmental data generation has been done for the period of 1st April 2015 to 30th June 2015. The study area within a 10 km radius around the proposed terminal site has been considered as general impact zone and 2 Km radius as influence zone for EIA study. Primary and secondary data has been collected for both the zone however focus of primary data generation has been more for 2 Km radius. Data was generated by following the monitoring plan approved by IWAI and World Bank in line with prescribed TOR by IWAI.

The Salient Environmental Features of Ramnagar Terminal Project within 500m, 2 Km and 10 Km radius is summarised at **Table 1.1**.

Table 1.1 : Salient Environmental Features of Ramnagar Terminal Site

S. No.	Environmental Features	Within 500 m area around Proposed terminal site	Within 2 km area around Proposed terminal site	Within 10 km area around Proposed terminal site
1	**Ecological Environment**			
A	Presence of Wildlife Sanctuary/ National Park/Biosphere Reserves	None	None	Kashi Turtle Sanctuary is located about 2.3 km downstream of the Ganga river
B	Reserved /Protected Forests	None	None	None

S. No.	Environmental Features	Within 500 m area around Proposed terminal site	Within 2 km area around Proposed terminal site	Within 10 km area around Proposed terminal site
C	Wetland of state and national interest	None	None	None
D	Migratory route for wild animals	None	None	None
E	Presence of Schedule-I Terrestrial Fauna	None	None	None
F	Presence of RET Aquatic Fauna	Yes, Turtle species present in Kashi turtle sanctuary	Yes, Turtle species present in Kashi turtle sanctuary	Yes, Turtle species present in Kashi turtle sanctuary
H	Tree cover	12 Khajur tree and 8 nos. of babul shrubs are present	Yes Scattered vegetation is present	Yes Scattered vegetation is present.
2.	**Physical Environment**			
I	Critically Polluted Area	None	None	None
J	Road connectivity	Site is connected with NH-7 and NH-2 through village road	NH-7 and NH-2	NH-7 and NH-2.
K	Rail connectivity	None	Jeonathpur about 4.0 km in SE	Maruadih 9.0 km and Varanasi 9.3 Railway station.
L	Topography	Mainly flat with elevation ranges between 74-77 m	Flat terrain. Elevation ranges between 60 to 85 m	Flat terrain. Elevation ranges between 55 to 95 m
M	Seismicity	Falls in Zone-III (Moderate damage risk zone)	Falls in Zone-III (Moderate damage risk zone)	Falls in Zone-III (Moderate damage risk zone)
N	Surface Water Resources (Rivers)	Ganga River (along western boundary of site)	Ganga River	Ganga River
O	Groundwater	Falls in Safe Zone as per Central Ground Water Board	Falls in Safe Zone as per Central Ground Water Board	Falls in Safe Zone as per Central Ground Water Board
P	Soil and Land-use	Clay loam Fallow agricultural land	Clay loam and sandy loam Land use in 2 km area of site is primarily is under agricultural, water fallow land, and Settlements.	Clay loam and sandy loam Land use in 10 km of site: About 57.87% of the land is under cultivation, 29.85% of the land is under settlement, 6.2% land is under water bodies and rest is under other uses.

S. No.	Environmental Features	Within 500 m area around Proposed terminal site	Within 2 km area around Proposed terminal site	Within 10 km area around Proposed terminal site
Q	State Boundary	None	None	None
3.	**Social Environment**			
R	Physical Setting	Rural Settings	Rural Settings	Rural/ urban and industrial Settings
S	Physical Sensitive Receptors	None	Yes (Temples, Schools, Health care)	Yes (Temples, Schools, and Hospital etc.)
T	Archaeological Monuments	None	Ramnagar Fort 2.0 km in North	Yes Temples

Meteorology: The predominant wind direction is from Northwest. The average wind speed ranges from 1.8 to 5.0 km/hr. Daily mean temperature varied from 22.1oC to 40.4oC. The relative humidity varied from25% to 51%. The annual average rainfall is1000 mm.

Air Quality: As per air quality monitoring study, the ambient air quality of the study area is meeting the prescribed National Ambient Air Quality Standard at all locations except Ramnagar location, where the RSPM values are high in terms of NAAQS. This is mainly due to the heavy traffic load on SH-7 and other commercial activities in Ramnagar.

Noise Quality: Noise quality has been monitored at eight locations within the study area. The noise levels in the study area were found to be within the national standards for residential area (45 dB(A) during night time and 55 dB(A) during day time,) and commercial area (55 dB(A) during night time and 65 dB(A) during day time.

Water Quality: Eight samples of ground water and three samples of surface water have been collected from the study area. Surface water quality of the Ganga River in upstream and downstream point of project site was found to meet the Best Designated Use – 'D' Criteria of CPCB (fit for fish propagation). Surface water quality of Nala is not meeting any of the category of Best Designated Use Criteria of CPCB. All the parameters in ground water sample were well within the permissible limit prescribed in Indian Standard IS: 10500-2012.

Soil Quality: Soil samples from surrounding agriculture fields were collected for analysis. pH of the soil samples ranges from 6.9 to 7.7 indicating the soils are neutral to slightly alkaline in nature. Texturally, the soils of study area are observed as Sandy Loam, & Clay Loam Soils. Available Nitrogen, potassium and phosphorus content in the surface soils are in moderate range. Overall, the soil of the study area is moderately fertile.

Flora & Fauna: The proposed site is devoid of any major plantation. Some agriculture activities were taken up by nearby villagers within the land in the past but these activities have been discontinued now. Now the land is categorized as fallow land. There are about 12 small trees of Khajur (Phoenix sylvestris) and 8 trees of Babool shrubs (Acacia spp.) are present in the identified land. The access road to connect site crosses through the Ralhupur village. This road is pucca upto the Ralhupur village. About 700 m stretch that connect

terminal site to Rahlupur village need to be some levelling and widening. Trees of Jamun, Peepal, Babul and Sisham etc are present along this road. Houses and shops also exist along the access road. The access road (700 m stretch that have to develop) is almost clear, only one or two trees of Jamun, is present along the road alignment that may require to be removed. One big tree also requires some chopping for clearing the passes. No significant flora or fauna was observed during the site visit except nilgai which was spotted during site visit.

Socio-economic: Administratively the villages and settlements within 10-km area around the proposed site fall in Varanasi, Chandoli and Mirzapur District of Uttar Pradesh. As per the census records of 2011, there are One hundred sixty-one (161) settlements in the study area falling within the study area. Total no. of households was recorded as 255682 in the study area. Total population of the 10-km radial zone / study area is 1614854 comprising 854215 males and 760639 females respectively. Sex ratio was also observed as 890 females per 1000 males in the study area.

1.4. Environmental Management and Monitoring Plan

Effective measures are required to be proposed and implemented during design, preconstruction, construction and operation stage to eliminate or minimize the impact of the project development. **Table 1.2 & 1.3** provides details of mitigation measures with implementation and supervision responsibility.

Since project is likely to have impact on various components of environment, the monitoring requirement covering soil erosion, tree plantation, air quality, water quality noise, river sedimentation has been defined and included under respective head at **Table 1.4.**

It will be essential for contractor to comply with applicable regulations and World Bank safeguard requirements. Contractor will also have to comply with applicable standards with respect to Water, air, Noise, Dredge Material, soil and biodiversity as applicable to this project.

1.5. Environment Health and Safety Cell

It is essential to establish environment health and safety cell for the project by contractor to ensure the health & safety of workers and environmental management of study area through effective implementation of EMP. Highly qualified and experienced persons in the field of Environmental Management of Similar projects shall be considered to man the cell who shall ensure the effective implementation of the environment management plan.

1.6. Reporting Requirements:

It is required that contractor will submit quarterly compliance report to Project Management Consultants (PMC) as well as to PMU (Project Management Unit) of IWAI. PMC will analyse the report and notify the corrective action if any required to contractor under intimation to IWAI.

Table 1.2 : Environment Management Plan Varanasi Terminal During Construction Phase

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
1. Climate							
1. Project is unlikely to cause negative effect on climate. However, project can contribute positively for climate	• Avoid cutting any tree standing on the proposed terminal site or temporary accesses area of 600-700 m length. • Prior permission shall be taken for cutting any tree. • Compensatory tree plantation shall be carried out for any tree cut (as per state forest policy (minimum 1:2)) • Addition plantation of local variety of tree (200 nos one row of tree on three side of the terminal land) shall be carried out along boundary of the terminal site (Greenbelt development plan All terminal buildings should have energy efficient design. It should follow GRIHA guidelines and aim for highest ratings under GRIHA. **Annexure-1.1**)	Forest Conservation Act, 1980	Access road area and proposed terminal area	During design and Pre-Construction Stage	Compensatory for 200 trees	Contractor	IWAI/SEMU/PMC[1]
2. Natural Hazard							

[1] It is proposed to set up Social and Environmental Management Unit (SEMU) in IWAI to manager social and environmental aspect of NW1 augmentation. PMC (Project Management Consultants) anticipated to be appointed for project management and quality check.

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
2. Earthquake- Seismic Zone III i.e., Moderate damage risk zone[2]	Adoption of Relevant IS codes while designing the civil structures to sustain the earthquake of moderate to high magnitude. **(Annexure 1.2)**	Applicable BIS Standards	Project area	During design and Pre-Construction Stage	Part of Project Costs	Contractor	IWAI/SEMU/PMC
3. Site Preparation: **Access road, Construction Camp, Construction Site**							
3. Improvement of Access road: pavement of the road, Disposal of accumulated	**Improvement of Access Road:** • Access road route and alignment (for unpaved area) shall be finalized and submitted to PMC and IWAI for their	Municipal Solid Wastes (Management and Handling)	Juncture of Access road and Entrance phase 1A	During design and Pre-Construction	Part of Project Costs	Contractor.	IWAI/SEMU/PMC

[2] *IS:1893 (Part 1): 2002 Indian Standard Criteria for Earthquake Resistant Design of Structures Part 1 General Provisions and Buildings Fifth Revision divides the Indian subcontinent into five seismic zones (II to V) depending on the magnitude and damage intensity of seismic activity*

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
Municipal Solid Waste[3]: Loss of Agricultural land, loss of tree, air and noise pollution	concurrence. • Tree shall not be cut. Alignment shall be suitable adjusted to avoid cutting of the tree. If unavoidable, then tree shall be cut with due permission from concerned district/forests authorities. • Trimming of the large tree standing close to the site shall be done as minimum as possible. • Provision shall be made for dust suppression during its use. • Provision shall be made (safety boards, speed control, traffic guards) to prevent accident. • Survival rate of tree shall be regularly monitored. It is shall be minimum	Rules, 2000, Social Impact Assessment requirements	terminal site	Stage			

[3] Substantial municipal solid waste is disposed at the entrance and around the proposed terminal site requiring proper management of the same.

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	70%. **Municipal Solid Waste Management** • Arrangement shall be made for identifying the area for disposal of construction debris and notify to IWAI. The site should be minimum 1000 m distance from the river bank, residential area and sensitive areas like hospitals, school and temples. • Arrangement shall be made for segregation of waste generated from construction site into recyclable, compostable and non-compostable waste. • Resalable/recyclable waste shall be sold off to authorized agencies. Compostable waste will be composted in pits at site and non-compostable waste shall be disposed off to designated landfill site. If designated landfill site not available, then debris disposal site shall be identified. **(Annexure-1.3)**						
4. Setting of Labour Camps: Loss of agriculture land, contamination of land and water resources from municipal waste from Camps, worker's health, Pressure on natural resources due to establishment of labour camps	**Location of Camp:** • Agriculture land should not be used for development of construction labour camps. Barren/waste land should be used • Site identified by contractor should be approved by the engineers of PMC/IWAI • Proper closure, stabilization and rehabilitation of the area should be carried out as soon as the activity is	The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 and Cess Act of 1996	Labour Camp Locations	During design and Pre-Construction Stage	For sanitation some health facilities.	Contractor.	IWAI/SEMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	completed • No land should be used for above purpose without consent of land owner. **Sanitation and Worker's Health:** • Camp shall be well ventilated. It should have adequate provision for illumination, kitchen and safe drinking water facility shall be provided at the camp • Adequate bathing and sanitation facilities to be provided at labour camp. Mobile Toilets shall be provided. Soak Pits can be provided only if labour camp is located away from river. • Proper drainage to be maintained around the sites to avoid water logging leading to disease • Preventive medical care to be provided to workers- six monthly medical check-up should be organized • Waste will be collected &segregated within site into recyclable, compostable and inert waste. Recyclable waste will be sold off to authorized dealers. Compostable waste shall be pit composted and inert waste shall be sent for disposal to landfill or site identified for debris disposal. • Provision shall be made for essential material supply like cooking fuel (only LPG gas should be used, open	and The Water (Prevention &Control of Pollution) Act, 1974 and amendments thereof. Municipal Solid Wastes (Management and Handling) Rules, 2000					

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	burning of fuel should not be allowed) Provision shall be made for day crèche for children						
5. Setting up construction Camp: Concert Mix Plant, Hot Mix Plant, Mechanical Workshop, Fuel storages, Lubricant storages	• All these facilities shall be installed at proposed terminal site itself. In case these are to be set up away from site than these shall be located at minimum distance of 500 m from habitation, water bodies and 1000 m from forest areas. • All maintenance facilities, hot mix plant and concrete missing plant shall be established with prior consent to establish to be obtained from SPCB. • All such equipment/plant shall be fitted with air pollution control system and shall comply with condition of consent to establish. • Periodic monitoring shall be carried as per consent conditions. **(Annexure-1.4)**	Air (Prevention and Control of Water Pollution) Act, 1981 and Water (Prevention and Control of Water Pollution) Act, 1972	Site construction Camp	During design and Pre-Construction and construction Stage	For sanitation some health facilities.	Contractor.	IWAI/SEMU/PMC
4. Site Preparation: Power supply, Water Supply, Drainage and disposal of muck and debris							
6. Power supply and Energy Conservation: Air Pollution, energy loss	• Power shall be sourced from national/state grid. DG sets shall be used only during power failure. • Back-up power shall be set up with all provisions of containment for fuel leakages, air pollution control (stack height as per regulation), and with acoustic enclosure. • Solar energy shall be used in common lighting area on 1:2 basis. • Buildings designed should have green infrastructure. Measures should be	Energy Conservation Building Code 2007	Construction Sites, Access road, and Labour Camp Locations	During design, Pre-Construction Stage	Part of Project Costs	Contractor.	IWAI/SEMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	taken to conserve energy as per ECBC norms as applicable.						
7. Water Supply, Drainage and effluent discharge	• The Area is under safe category as per Central Ground Water Board. However, necessary permission shall be taken from district authorities as applicable before digging the bore well. • Staff and visitors should be made aware about water conservation by displaying posters and signage • Garland storm water temporary drains shall be developed around the site to prevent any direct discharge of contaminated or soiled water to river. It shall be pass through di-siltation chamber and water collection pit. Collected water shall be used for construction purposes. • All washing and maintenance effluent from the workshop area of vehicle maintenance area should drain to separate collection areas fitted with oil and grease trap and de- siltation chamber. The treated water shall be used for dust suppression and green belt development. This water shall not be discharged to river at all.	Central Ground Water Board, Local regulations.	Construction Sites, and Labour Camp Locations	Pre-Construction and construction Stage	For construction of grease traps and de-siltation chambers	Contractor.	IWAI/SEMU/PMC
8. Disposal of piling earth, muck and debris: uncontrolled disposal may lead to increased sedimentation of the river.	• Provision shall be made for collection and draining of water for the piling earth. It shall be used for embankment protection or road construction depending on its suitability. • Provision shall be made for geo		Terminal area River Bank along the terminal site	Pre-Construction and construction Stage	Part of Project Costs	Contractor.	IWAI/SEMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	Synthetic Screen for arresting silt flowing down stream.						
5. Embankment Design and Construction, Drainage Pattern and Fishermen's Access to River.							
9. River Bank Erosion Protection: Construction of Embankment and construction of berth: may lead to accumulation of sediments on the up drift side and erosion of the down drift side. Contamination of river water quality and land may happen due to river bed material	• Embankment protection measures (stone pitching) shall be made in both upstream and downstream to the extent that erosion is minimized. • Erosion monitoring shall be carried out periodically downstream as well. • River Bed material shall be tested for contaminants before its use or disposal for land fill site. If any level of heavy metal contamination is found than it shall be disposed off in a secure manner.		River Bank along the terminal site	During design, Pre-Construction and construction Stage	Part of Project Costs	Contractor.	IWAI/SEMU/PMC
10. Drainage Pattern	• Natural Drainage pattern of area around shall be maintained. No waste shall be allowed to dumped to industrial effluent Nala flowing adjacent to the terminal site. Its opening to river shall not be obstructed in any manner.		Construction Sites, Access road, and Labour Camp Locations	Pre-Construction Stage and construction stage	Part of Project Costs	Contractor.	IWAI/SEMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
11. Access to river: restricted movement of fisherman[4]	Fishing activities are seen in the river close to site. Arrangement shall be made to provide free access to river and undisturbed safe movement of the fishermen.		Terminal site and area around	Construction Stage	Part of Project Costs	Contractor.	IWAI/SEMU/PMC
6. Construction Material Sourcing							
12. Borrow areas for sourcing earth for filling as required (erosion, loss of productive land, land degradation, air pollution)	• Non-productive lands, barren lands, raised lands; wastelands shall be used for borrowing earth with the necessary permissions/consents. • Agricultural areas not to be used as borrow areas unless requested by the landowner for lowering the land for making it cultivable. • Excavation depth should not exceed 1.5 m bgl • Environmental Clearance from State Environmental Impact Assessment Authority and required permission from District Magistrate shall be obtained prior to excavation. Copy of this permission shall be submitted to IWAI before start of excavation. • Record of location, area,	IRC Guidelines on borrow areas and for quarries. EIA Notification 2006(under Environmental Protection Act and Rules, 1986;)	All Identified Borrow sites	During design and Pre-Construction Stage	Part of Project Costs	Contractor	IWAI/SEMU/PMC

[4] Fishing activities are seen. Local fisherman are seen fishing close to river areas. They access the river from small temporary access around the s

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	accessibility to the location and photograph of borrow area should be maintained prior to excavation • Site selected for borrow area should be approved by PMC & IWAI expert prior to excavation • Ridges of not less than 8m width will be left at intervals not exceeding 300m. Small drains will be cut through the ridges, if necessary, to facilitate drainage. • The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal). • Topsoil to be stockpiled and protected for use at the rehabilitation stage. • Rehabilitation shall be satisfactorily undertaken immediately after the use has ceased and at least three weeks prior to monsoon. • Unpaved surfaces used for the haulage of borrow materials to be maintained. • Transportation of earth materials shall be through covered vehicles.**(Annexure 1.5)**						
13. Quarries for sourcing stone and aggregates (loss of productive land, land degradation, air pollution. Any illegal quarrying may lead to land use change, unstable rock formation)	• Aggregates required for embankment stone pitching and roads shall be procured from licensed quarries. • It shall be ensures that selected quarries are having requisite environment clearance, and comply with Air Pollution Control and Noise level requirements as per the law.	EIA Notification 2006(under Environmental Protection Act and Rules, 1986;)	Quarry Site	During design and Pre-Construction Stage	Part of Project Costs	Contractor	IWAI/SEMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	• Copy of Environmental Clearance letter and Consent to Operate and shall Be obtained and submitted to IWAI. • Material shall be transported under covered trucks only. • No new quarry shall be opened without due permissions. • Each Quarry shall be visited prior to its selection to ensure its compliance with lease conditions, EC and consent conditions. • Stone crushers, if required, shall be set up only after consent from SPCB and taking adequate measures for air pollution control.						
7. Protection of Flora and Fauna							
14. Protection of Tortoise: Increased sedimentation downstream of construction site	• Tortoise Sanctuary is located at about 2.3 Km from site. Necessary permission shall be obtained from National Board of Wild Life prior to start of construction • No movement of tortoise is reported upward to the site. No harm shall be caused to these tortoises in case any tortoise is sited. Necessary caution notice shall be displaced and conveyed to all construction workers and officers. • Geo-Textile synthetic sheet curtain shall be placed around pilling and construction area to prevent movement of sediments and construction waste.	Wild Life (Protection) Act, 1972	In and Around Project Site	During the design and Construction stage	Part of project costs	SEMU through DFO	IWAI/SEMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
15. Terrestrial Fauna: increase in hunt tendency[5]	• Caution sign shall be placed to prevent hunting of wild animal and birds. • Provision shall be made for strict penalty for hunting these animals. • High noise construction work shall not be made in night.	Wild Life (Protection)Act, 1972	In and Around Project Site	During the design and Construction stage	Part of project costs	Contractor	IWAI/SEMU/PMC
16. Vegetation loss due to site preparation and construction activities	• Tree shall not be cut as much as possible. Any tree cut shall be compensated with compensatory tree plantation as per state forest policy (minimum 1:2). • Tree plantation shall be made as feasible at site and around the site depending on land availability. • Provision of LPG shall be made in construction site camp and labour camp as fuel source to avoid tree cutting. • Proper arrangement of lighting should be made at site and construction labour camp Open burning of fuel for any purpose	Forest Conservation Act, 1980	In and Around Project Site and labour camp	During the design and Construction stage	Part of project Costs	Contractor	IWAI/SEMU/PMC

[5]Peacock and Wild Neel Gai are sited next to project site.

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	should not be allowed at the site						
17. Effect on Aquatic life such as Fish, Plankton[6]	• No breeding ground is noticed around the project site. However, construction activity shall be restricted during spawning period of June to August. • Sedimentation and siltation shall be prevented/ controlled to maintain productivity of aquatic ecosystem and ensure availability of food for aquatic fauna & flora.		Terminal construction site	During the design and Construction stage	Part of project Costs	Contractor	IWAI/SEMU/PMC
8. Air Quality							
18. Fugitive Dust Generation due to construction activities	• Transport of loose and fine materials through covered vehicles. • Loading and unloading of construction materials in covered area. • Approach roads shall be paved and widened. • Water spraying on earthworks, unpaved haulage roads, other dust prone areas and construction yard. Make Provision of PPEs like face mask to workers.	Environmental Protection Act, 1986 and amendments thereof; The Air (Prevention and Control of Pollution) Act, 1981 and amendments thereof	Construction sites, Loading areas, storage areas,	During the Construction stage	Part of project Costs	Contractor	IWAI/SEMU/PMC

[6]The floodplain fisheries are dominated by major and minor carps viz, Labio rohita, Catla catla, Cirrhinus mrigala, L. bata, Puntius sps. and catfishes viz. H. fossilis, Mystus sps, etc. and fishes of family Clupeidae, Notopteridae and a mix of many other families.

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
19. Exhaust gas emissions from machinery and vehicular traffic.	• Regular maintenance shall be carried out of machinery and equipment. • Periodic Ambient air quality monitoring shall be carried out. • DG sets to be fitted with stacks of adequate height and low sulphur diesel to be used in DG sets as well as in machineries. Monitoring of air quality for PM_{10}, $PM_{2.5}$, SO_x, NO_x, and CO shall be carried out quarterly at construction site. Stack monitoring shall be carried out every month at the site.	Environmental Protection Act, 1986 and amendments thereof; The Air (Prevention and Control of Pollution) Act, 1981 and amendments thereof	Construction camps and sites, concrete mixing plant, DG sets locations	During the Construction stage	Part of project Costs	Contractor	IWAI/SEMU/PMC
20. Emissions at access road: avoidance of traffic Jams[7]	• Efforts shall be made to move construction material early morning and late evening period. • Traffic regulators (Guard) shall be posted in habitat area and at key junction areas to avoid congestion	-do-	Access road	During the Construction stage	- Do -	Contractor	IWAI/SEMU/PMC
9. Noise and Vibration							

[7] The roads connecting the proposed sites is narrow and also passes through habitat area. Traffic remains heavy.

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
21. Noise from construction vehicle, equipment and machinery.	• All equipment to be timely serviced and properly maintained to minimize its operational noise. • Construction equipment and machinery to be fitted with silencers and maintained properly. • Provision of temporary noise barrier near habitat areas during construction phase. • Protection devices (ear plugs or ear muffs) will be provided to the workers operating in the vicinity of high noise generating machines. • Speed control shall be enforced in habitat areas. • The ambient noise level as per CPCB standard is 55 dB(A) and 45 db(A). Current noise level at habitat area meets the standard • Noise monitoring day and night at site, labour camp and access road area shall be carried quarterly to ensure the effectiveness of mitigation measures.	Noise Pollution (Regulation and Control) Rules, 2000 and amendments thereof	Construction Site and accesses road.	During the Construction stage	Part of project Costs	Contractor	IWAI/SEMU/PMC
10. Land-use and Landscape							
22. Land use Change and Loss of productive/top soil	• Efforts shall be made to improve the aesthetic of the area. No construction waste or other wastes shall be dumped at unidentified areas. Caution board in local language shall be placed at different locations to prevent dumping of waste generated from construction site in the river and nearby areas • Compensatory tree plantation for loss	Design requirement	Around project site area and borrow area	During construction Stage	For five caution boards	Contractor	IWAI/SEMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	of trees. • Top soil shall be preserved and laid over either on the embankment slope for growing vegetation to protect soil erosion or spread over in the proposed plantation areas. • Land earmarked for dumping of construction waste shall be free from any social and R&R issue and away from settlements.						
23. Soil erosion due to construction activities, earthwork	• Provision of cross drainage structure shall be made in the access road if required to maintain the natural drainage pattern. • Provision of side drain shall be made in access road if required to prevent water logging. • Measures like building of scouring protection structures, protection by geo-textiles matting etc shall be made, if river bank erosion is found around the terminal area. • Bio-turfing of embankments shall be made enhance the slop stabilization.		Access road and river bank	Construction stage	Part of project costs	Contractor	IWAI/SEMU/PMC
24. Soil erosion at earth stockpiles	• The earth stockpiles to be provided with gentle slopes to prevent soil erosion.		At earth stockpiles	Construction stage	Part of project costs	Contractor	IWAI/SEMU/PMC
25. Compaction and contamination of soil due to movement of vehicles and equipment	• Fuel and lubricants to be stored at the predefined storage location. • Storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils. • Provision of “oil interceptors” at wash-down and re-fuelling areas.		Terminal site	Pre-construction and construction stage.	Part of project costs	Contractor	IWAI/SEMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	• Oil and grease spill and oil soaked materials are to be collected and stored in labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to SPCB/ MoEF authorized vendors. • Movement of construction vehicles, machinery and equipment shall be restricted to the designated haulage route.						
11. Water Resources							
26. Depletion of Groundwater resources due to unregulated abstraction for construction purpose	• Preference shall be given to source water from rivers wherever feasible in the project area with due permission from authorities. • Augmentation through incorporating water harvesting structures if technically feasible. • Construction of check dams in consultation with community to reduce burden on ground water resources if technically feasible. • Efforts to restrict water intensive activities during summer period (April, May, June)			During Construction stage	Part of project costs	Contractor,	IWAI/SEMU/PMC
27. Increase in water Siltation levels due to construction of terminal and contamination due to disposal of domestic waste	• The piling work shall be undertaken during low flow period. • Restoration of changes in the stream, if any, made during construction to its original level. • Precautions shall be made that no nala or canal is clogged. • Substructure construction should be limited to the dry season and		Terminal Site	During Construction stage	Part of project costs	Contractor	IWAI/SEMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	cofferdams may be constructed and utilized to lift the spoil directly out of it and carried to the riverbank for land disposal. • Mobile toilets with anaerobic digestion facility shall be fixed at construction site. No domestic waste shall be discharged to river.						
12. Accident and Safety Risks							
28. Accident risk from construction activities	• Contractors to adopt and maintain safe working practices. • Usage of fluorescent signage, in local language at the construction sites • Training shall be provided to workers, especially machinery operators, on safety procedures and precautions. • The contractors to appoint a safety officer mandatory. • At every work place, a readily available first aid unit including an adequate supply of dressing materials, a mode of transport (ambulance), nursing staff, and doctor to be provided. • Required PPE shall be provided to workers. • Half yearly medical check-up shall be carried of the workers and summary report shall be submitted to PMC	Central Motor and Vehicle Act 1988 EP Act 1986 Noise Rules 2002	Construction sites	Construction period	Part of project costs	Contractor	IWAI/SEMU/PMC
13. Shifting of Common Property Resources and other Utilities							
29. Shifting of community properties and utilities	As per assessment, no such shifting is involved. However, if any shifting is involved it shall have done at suitable		Project Area	Pre-Construction	Part of Project Costs	Contractor	IWAI/SEMU/PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	location with the concurrence from local authorities and community.						

Table 1.3 : Environment Management Plan Varanasi Terminal During Operation Phase

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
OPERATION AND MAINTENANCE STAGE								
1. Climate								
1.1 Impact on Climate	• Ensuring survivability of trees planted under greenbelt minimum 70% survival rate and create additional GHG sink by planting additional trees • Adopting all energy efficiency measures e.g the terminal building should have a platinum rated for Green building provisions • Street lighting solar lighting provisions (on 1:3 ratio of minimal needs) along with solar power generation system should also be provided as to meet the other power requirements of the terminal thus reducing dependence on power grid supply.	Kyoto Protocol, National Water Policy, 2012, Forest Conservation Rules &National Forest Policy	Terminal site	Survival rate of trees and monitoring performance of energy conservation equipments	• Observations and inspection	Aftercare & Monitoring of 200 trees	IWAI	IWAI
2. Air Quality								

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
2.1 Air pollution due to due to vehicular movement& loading and unloading areas	• Construction raw material and debris shall be transported and stored in covered condition • Transportation vehicle shall be properly serviced and maintain and shall carry PUC certificate • Thick green belt shall be developed and maintained all along the periphery and along the roads. The green belt shall be developed in canopy shape with local species of broad leaf variety. Species selected for development of green belt shall also be tolerant to expected pollutants and shall have the ability to adsorb the pollutants. Suggested species are suitable for different areas are also listed under CPCB guidelines for green Belt development. • Water sprinkling should be carried out during all loading and unloading activities and in storage yards. Further dust suppression measures should be taken at the site like vaccum collectors at dust generation areas. • Mechanical conveying system with provision of dust	Environmental Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981	Throughout the project area	MI: Ambient air quality (PM_{10}, CO, SO_2 NO_x) PT: Levels are equal to or below baseline levels given in the EIA report	• As per CPCB requirements • Site inspection	Included in Operation / Maintenance cost	IWAI	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	collection should be provided for barge loading • Green belt planted should be maintained and survival rate of plantation should be maintained to minimum 70% • Monitoring of air quality shall be carried out on monthly basis to check the level of pollutants and effectiveness of proposed EMP • It is recommended to provide mechanical conveying system with provision of dust collection system for loading/unloading material from barges. Pneumatic transfer only should be preferred for flyash transportation • Minimizing free fall of materials to reduce the dust generation • Minimizing dry cargo pile heights and containing piles with perimeter walls • Removing materials from the bottom of piles to minimize dust re-suspension • Regularly sweeping docks and handling areas, truck / rail storage areas, and paved roadway surfaces • Keeping transfer equipment (e.g. cranes, forklifts, and trucks) in good working							

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	condition8 • Upgrading the land vehicle fleet with less-polluting trucks and vehicles, and using alternative fuels and fuel mixture							
3. Noise Quality								
2.1 Noise due to operation	• Site boundary should be provided which can act as noise barrier • Provision of thick green belt along the boundary and roads which will act as noise buffer • Earplugs should be provided to workers involved in unloading operations • Provision of thick green belt along the boundary and roads which will act as noise buffer • Timely maintenance and servicing of transportation vehicles and the machinery/pumps to be used during operation phase to reduce the noise generation due to friction and abrasion • Honking shall be prohibited at the project site • Hearing test for the workers shall be undertaken before	Noise Rules, 2000	Site and Nearby areas	MI: Noise levels –day & night PT: Levels are equal to or below baseline levels given in the EIA report	Measuring by noise meter 24 hourly	Included in Operation / Maintenance cost	IWAI	IWAI

[8] IFC Environmental, Health & Safety Guidelines-Ports, Harbors and Terminals

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	employing them and thereafter shall be done after every six months • Job rotations should be practiced for people, working in high noise level areas • No noise generating activity shall be carried out between 6:00 AM to 10:00 PM • DG sets shall be provided with acoustic enclosure • Monitoring of Noise levels shall be carried out on monthly basis to check the level of pollutants and effectiveness of proposed EMP							
3. Land and Soil								
3.1 Soil erosion at embankment during heavy rainfall.	• Periodic checking to be carried to monitor the soil erosion along the River Banks at and near terminal area • Necessary maintenance should be undertaken wherever it is required	Project requirement	Along river bank	MI: Existence of soil erosion sites Number of soil erosion sites PT: Zero or minimal occurrences of soil erosion	On site observation	Included in Operation / Maintenance cost	IWAI	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
3.2 Soil contamination	• Fuel shall be stored in HDPE containers on paved surfaces only to prevent spillage of fuels on the soil and thus soil contamination. • Dustbins shall be provided at all the required locations at the site for collection of recyclable and non-recyclable waste. • Recyclable waste shall be sold to authorized vendors and non-recyclable waste shall be disposed off through authorized agencies and shall not be dumped in open. • Used oil from DG sets and other equipment shall be stored in HDPE containers in isolated location on paved surfaces and shall be disposed through authorized vendors only and shall not be dumped in open. • Room shall be provided for storage of E-waste at site and this waste shall be sold to authorized vendors periodically and shall not be dumped in open. • Municipal waste generated at terminal should either be sent for landfilling through authorized agencies or shall be composted within the	Project requirement	Terminal site, access road and along river bank	MI: Existence of soil erosion sites Number of soil erosion sites PT: Zero or minimal occurrences of soil erosion	On site observation	Included in Operation / Maintenance cost	IWAI	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	terminal site and manure should be used for maintaining the green area within the site • Vessel waste reception facility should be available at the terminal site incase maintenance facility is not in place. The waste should be received from the vessel in proper segregated and packed form.. This waste should be treated and disposed within the terminal site only but in case it is not feasible, tie ups with Government and authorized private agencies can be made for handling, treatment, storage and disposal of this waste. Also fee can be imposed on the vessel operator for letting them dispose their waste at terminal/maintenance facilities.							
4. Water resources/Flooding and Inundation								

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
4.1 Siltation	• Regular checks shall be made for bank protection works so as to check the bank erosion and increased sediment level in the river	Project requirement	Near surface Water bodies	MI: Water quality PT: No turbidity of surface water bodies due to the terminal activity	Site observation	Included in Operation/ Maintenance cost	IWAI	IWAI
4.2 Water logging due to blockage of drains, culverts or streams	• Regular visual checks and cleaning of drains provided at site shall be done to ensure that flow of water is maintained and prevent water logging. Drains and cross drainage structures shall be regularly cleaned and de-silted • Drains shall be regularly cleaned and de-silted • Monitoring of water borne diseases due to stagnant water bodies • Storm water drains provided in parking & road areas shall be provided with oil & grease traps	Project requirement	Near surface Water bodies	MI: Presence/ absence of water logging along the approach road/terminal area PT: No record of overtopping/ Water logging	Site observation	Included in Operation/Maintenance cost	IWAI	IWAI
4.3 Waste Water treatment and conservation	• Provision of storm water harvesting system at site. Roof top rain water should be collected in separate collection pond and should	Project requirement	Project area	MI: proper treatment PT: treated water quality	Treatment parameter, ph, BOD, TDS etc.	Included in Operation/Maintenance	IWAI	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	be used for horticulture and cleaning purpose at site. • Toilets to be provided with running water facility to prevent open defecation. • Sewage should be treated in STP • Water conservation fixtures shall be installed in toilets and kitchen area. Some of the water conservation fixtures which can be installed are dual flushing cisterns, sensor taps, low water urinals etc. • No wastewater shall be received from vessels and vessels should not be allowed to discharge their wastewater and solid waste in river • Fuel shall be stored in leak proof containers and containers shall be placed on paved surfaces • Monitoring of surface water quality shall be carried out on monthly basis to check the level of pollutants and effectiveness of proposed EMP • Oil should be stored in leak proof containers and storage area should be provided with facility of collecting the oil in case of spillage. The storage			check		cost		

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	facility should be so designed that spilled oil shall not enter the storm water and sewage drains or storm water storage pits. Oil storage facility should be contained. Oil & grit seperators should be provided in the storm water drains in these areas. • Fueling of vessels is not proposed at terminal facility but in case fueling is carried out then Fuel dispensing equipment should be equipped with "breakaway" hose connections that provide emergency shutdown of flow. Fueling equipment should be inspected daily to ensure all components are in satisfactory condition							
5. Flora& Fauna								
a. Terrestrial Flora & fauna	• Thick green belt will be developed at site by the time operation starts at the project site. This will improve the ecology of the area and will provide the habitat to avifauna. • 70% survival of the plantation shall be maintained. The tree survival audit to be conducted at least once in a	Forest Conservation Act 1980, Wild Life Protection Act, 1972	Project tree plantation sites.	MI: Tree/plants survival rate PT: Minimum rate of 70% tree survival	Records and field observations. Information from Forestry Department	Operation/ Maintenance Cost	IWAI/Forest Department	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	year to assess the effectiveness • Dust suppression should be carried out • Water sprinkling should be carried out on internal as well as on approach road to the site • Stack height in DG set shall be provided as per the CPCB norm. • Native plant species should preferably be planted at site • Shed leaves, branches and flowers should be composted and should be used as manure within the site • STP sludge should also be used as manure at the site. No chemical fertilizers, pesticides or insecticides should be used at site as it may wash-off with run-off and may enter the river impacting aquatic ecology • Possibility of composting the food waste within the site should be explored and composted waste should be used as manure within the site • Instruction should be given to all the workers and visitors that no harm to the plantation at the site or any							

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	animal should be done within the project premises							
b. Impact on Aquatic Flora & Fauna due to vessel movement & discharge of waste c. Impact Due to Oil spillage	• Water sprinkling should be carried out at the storage yards to minimize the dust generation and settling the dust on the River surface • Material loading or unloading from barges should be through mechanical covered conveyor system than through pay loaders/trucks/barge loaders • Moisture should be maintained in coal to reduce coal dust generation during loading/unloading at berth. • The solid wastes, sewage, oily ballast, bilge water and bunker fuel bottoms generated from barge should not be discharged directly and it should be discharged as per the norms. Cargo Operators needs to exercise all caution to avoid any kind of accidental discharge of such wastes. No provision of maintenance and repairing and fuel refilling of barge and vessels is proposed at terminal site hence chances of oil spillage is almost negligible due to	Bio-diversity conservation rules, Wildlife Protection Act, 1972	River stretch along the terminal	MI: Aquatic species PT: Should and similar to baseline	Surveys	For Aquatic Ecology Survey	IWAI	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	maintenance activities. • No wastewater or waste should be disposed off in river from terminal site or from vessel into the water. Penalty should be imposed on the vessels reported of disposing waste/wastewater in the river • Surface run-off from site should be collected and re-used at site for dust suppression. Run-off from building should be collected separately and should be used for plantation and cleaning purpose. • STP should be provided at site for treatment of sewage generated. No sewage should be allowed to enter in the river. Treated water from STP should be reused completely at site and should not be discharged into river • Dredged sand (if any) should not be disposed off in river or dumped near the river banks. • Dredging should be avoided during the breeding and spawning seasons • No dredging should be carried out within turtle sanctuary							

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	• Barge speed should be maintained less than 5 kmph • Instruction should be given to all vessels and all employee and staff that no aquatic faunal species should be harmed due to any reason • Waiting time of ships should be reduced at the terminal by providing the adequate loading and unloading equipment and vehicles. • Ships should be instructed for not using sharp lights and sounds as they may disturb aquatic organisms • Propeller guards should be provided for all the vessels to minimize the propeller inflicted injuries and scars to the aquatic organisms. • No developments should be brought up on other bank of river opposite to terminal site so as to provide the ground to aquatic organisms for their activities • Nesting grounds, breeding & spawning grounds shall be identified and project activities shall be minimized in those areas • Time schedule and the quantity of material allowed shall be strictly checked and							

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	monitored for each ship. This will prevent overcrowding of the vessels at terminal site and thus no obstruction will be there on movement of the aquatic organisms due to ships. • Waiting time of ships shall be reduced at the terminal by providing the adequate loading and unloading equipment and vehicles. • Ships shall be instructed for not using sharp lights and sounds as they may disturb aquatic organisms • Crew of the ships carrying the oil should be competent and experienced so as they can prevent the accidents to happen as much as possible • IWAI should carry out the inspections of the vessels which are transporting the material to and fro from the terminal. • Aquatic ecology monitoring should be carried out yearly so as to assess the impact of terminal activities on aquatic life.							
6. Safety								
6.1Accident risks associated with traffic	• Traffic control measures, including speed limits should be forced strictly. • Monitor/ensure that all	IRC: SP:55	Throughout the Project	MI: Number of accidents	Review accident	Included in operatio	IWAI	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
movement.	safety provisions included in design and construction phase are properly maintained • Movement of traffic shall be restricted to designate hours and routes. • Adequate illumination should be provided at the site during evening • Separation of people from vehicles and making vehicle passageways one-way, to the extent practical. • Existence of spill prevention and control and emergency responsive system at the site. Preparation of spill control and management plan for the terminal facilities & jetties • Locating means of access to ensure suspended loads do not pass overhead, to the extent practical • Constructing the surface of terminal areas to be: of adequate strength to support the heaviest expected loads; level, or with only a slight slope; free from holes, cracks, depressions, unnecessary curbs, or other raised objects; continuous; and skid resistant • Providing safe access		route	Conditions and existence of safety signs, rumble strips etc. on the road PT: Fatal and non-fatal accident rate is reduced after improvement	records Site observations	n /Maintenance cost		

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	arrangements suitable for the sizes and types of vessels calling at their facilities. These access arrangements should include guard rails and / or properly secured safety nets to prevent workers from falling into the water between the vessel side and the adjacent quay. • Inspecting and approving all slings before use • Clearly marking (indicating its own weight) all lifting beams and frames, vacuum lifting, or magnetic lifting device which does not form an integral part of a lifting appliance and every other item of loose gear weighing more than 100 kilograms (kg) • Inspecting disposable pallets and similar disposable devices before use and avoiding re-use of such disposable devices, Equipping lifting appliances with means of emergency escape from the driver's cabin and a safe means for the removal of an injured or ill driver • Risk of free fall of materials should be minimized by							

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	installing telescoping arm loaders and conveyors • Materials handling operations should follow a simple, linear layout to reduce the need for multiple transfer points							
6.2. Transport of Dangerous Goods	• Existence of spill prevention and control and emergency responsive system. • Emergency plan for vehicles carrying hazardous material should be available at the site and be implemented if required	-	Throughout the project stretch	MI: Status of emergency system – whether operational or not PT: Fully functional emergency system	Review of spill prevention and emergency response plan Spill accident records	Included in operation/Maintenance cost.	IWAI	IWAI
6.4 Accidents Risks Due to Movement of Vessels and other hazards associated with site	• Emergency preparedness plan for natural (flood & earthquake) and other hazards like fires, fall/trip, electric shocks etc shall be prepared and should be implemented during emergency condition. Mock drills should be conducted for workers to handle such emergency situation • Emergency collection area should be designated at the site which is safe. All workers should be directed	-	Throughout the project stretch	MI: Status of emergency system – whether operational or not PT: Fully functional emergency system	Review of spill prevention and emergency response plan Spill accident records	Included in operation/Maintenance cost.	IWAI	IWAI

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	to collect at this area in case of emergency. • Implementation of the environment management plan as proposed to prevent the environmental pollution during operation phase • Ships should comply with safety norms and should maintain the speed so as to prevent the accidents like oil spillage. In case of accidents, ship owner should be responsible for clean-up operations • Employment should preferably be given to local people. Women should be given equal opportunity for work. • Safety norms should be followed for all operational phase activities at terminal • Development activities should be carried out in the nearby areas for development of area • Fishing activity should not be restricted in the river. • Alternate provision for fishermen should be given in case fishing activity is restricted. • Firefighting facility should be provided at site and trained personnel should be							

Environmental Issue/ Component	Avoidance/Mitigation/ Compensation Measures	Reference to laws/ guideline	Location	Monitoring indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Institutional Responsibility	
							Implementation	Supervision
	available at site that can operate the fire extinguishers and other fire-fighting equipment.							

Table 1.4 : Environment Monitoring Plan of Varanasi Terminal for Construction & Operation Phase (Phase 1)

S. No.	Aspect	Parameters to be monitored	No of sampling locations & frequency	Standard methods for sampling and analysis	Role & Responsibility	
					Implementation	Supervision
Construction Period						
1.	Air Quality (Ambient & Stack)	PM_{10}, $PM_{2.5}$, SO_2, NO_x, CO	Three Locations including project site, once in two months	• Fine Particulate Samplers for $PM_{2.5}$ • Respirable Dust Sampler fitted PM_{10} • Respirable Dust Sampler fitted with Gaseous sampling arrangements for SO_2 and NO_x, CO analyser; TO-14A, TO-15, USEPA method for sampling	Contractor	IWAI & PMC
2.	Surface Water Quality	Physical, chemical and biological	River Ganga Once a month (upstream &downstream)	Grab sampling and analysis by using standard methods	Contractor	IWAI & PMC
3.	Drinking water Quality	Physical, chemical and biological	Drinking water for labour camps Once a month	Grab sampling and analysis by using standard methods	Contractor	IWAI & PMC
4.	Noise Level	Day time and night time noise level (max, min & Leq levels)	Construction labour camp, construction site and nearest	Noise meter	Contractor	IWAI & PMC

			village Once a month			
5.	Soil Quality & River Bed Sediment	Soil texture, type, Electrical conductivity, pH, infiltration, porosity, etc.,	Construction site, labour camps and debris disposal site Once in 6 months	Collection and analysis of samples as per IS 2720	Contractor	IWAI & PMC
6.	Plantation	Plantation survival rate	Terminal site	Survey, counting, recording & reporting	Contractor	IWAI & PMC
7.	Plantation	Plantation survival rate	Compensatory plantation site (if carried out)- Once in year	Survey, counting, recording & reporting	IWAI	IWAI & PMC
8.	Soil Erosion	---	Upstream & downstream of project site near river bank--Once a month	Survey & observation; Extent and degree of erosion; Structures for controlling soil erosion	Contractor	IWAI & PMC
9.	Aquatic ecology	Phytoplankton, Zooplankton	River Ganga Six monthly	Plankton net of diameter of 0.35 m, No.25 mesh size 63 and analysis by using standard methods.	Contractor	IWAI & PMC
10.	Integrity of embankment	---	Upstream & downstream of terminal site-Once a month	Survey & observation; Extent and degree of erosion; Structures for controlling soil erosion	Contractor	IWAI & PMC
Operation Phase						
1.	Air Quality (Ambient & Stack)	PM_{10}, $PM_{2.5}$, SO_2, NO_2, HC and CO	Three Locations including project site, once in two months - Six monthly	• Fine Particulate Samplers for $PM_{2.5}$ • Respirable Dust Sampler fitted PM_{10} • Respirable Dust Sampler fitted with Gaseous sampling arrangements for SO_2 and NO_x, CO analyser;	NABL accredited Lab to be contracted by IWAI	IWAI

				TO-14A, TO-15, USEPA method for sampling		
2.	Surface Water Quality	Physical, chemical and biological	River Ganga Once in quarter (Upstream & Downstream)	Grab sampling and analysis by using standard methods	NABL accredited Lab to be contracted by IWAI	IWAI
3.	Drinking water Quality	Physical, chemical and biological	Drinking water for staff-Once a quarter	Grab sampling and analysis by using standard methods	NABL accredited Lab to be contracted by IWAI	IWAI
4.	Noise Level	Day time and night time noise level (max, min & Leq levels)	Two locations: Project site & nearest habitation -Once in quarter	Noise meter	NABL accredited Lab to be contracted by IWAI	IWAI
5.	Wastewater Management	Physical, chemical and biological of sewage and STP treated water	Terminal site, testing of sewage and STP treated water Once in quarter	--	NABL accredited Lab to be contracted by IWAI	IWAI
6.	Plantation	Plantation survival rate of 70%	Terminal site and compensatory plantation site- Once In year	Survey, counting, recording & reporting	IWAI	IWAI
7.	Soil Erosion	---	Upstream & downstream of project site near river bank-Monthly	Survey & observation; Extent and degree of erosion; Structures for controlling soil erosion	IWAI	IWAI
8.	Aquatic ecology	Phytoplankton, Zooplankton	River Ganga-Six monthly	Plankton net of diameter of 0.35 m, No.25 mesh size 63 and analysis by using standard methods.	IWAI	IWAI
9.	River Bed Sediments	Physio-Chemical Parameters	Once in Six Month at Terminal Site Area	Depth Sampler	IWAI	IWAI
10.	Integrity of	---	Upstream &	Survey & observation; Extent	IWAI	IWAI

	embankment		downstream of terminal site- Once in six month	and degree of erosion; Structures for controlling soil erosion		

Annexure 1.1: Green Belt Development Plan

1.0 Introduction

Site for terminals/jetty/lock may support vegetation such as trees, shrubs herbs etc. Sahibganj site is the one out of four sites selected for terminals/locks support significant vegetation, i.e. mango orchards and other trees. Remaining sites supports some trees which may be required to cut or can be retained. Other sites which are not finalized may also support the vegetation which will be required to remove. Tree cutting shall be required at such sites and it should be carried out only after obtaining clearance from forest department. Only identified & permitted tree species shall be cut.

As per state forest policy compensatory afforestation should be carried out in ratio of at least at 1:2 ratios. Compensatory afforestation shall be carried out by forest department. It is preferable that compensatory afforestation is carried out in nearby land patch. Survival rate of the afforestation carried out by forest department shall be monitored by IWAI.

Apart from above compensatory plantation as part of environmental management, it is proposed to develop 15-20 m thick green belt all along the site boundary and along the roads within the site. Green belt shall be developed as per the following guidelines

1.1 Selection of Tree Species

The Project involve movement of vehicle for transportation of material Thus emissions like particulate matter, SO_2, NO_x& CO shall be generated at site. Also there is potential of generation of coal dust while unloading the materials at stock piles. Thus the plantation species tolerant to these pollutants and mitigate these from air shall be planted. Species selecting criteria is given below:

1. Tolerant to expected pollutants at site
2. Longer duration of foliage
3. Freely exposed foliage (adequate height of crown, openness of foliage, big leaves, small stomata apertures, stomata well exposed)
4. Leaves supported on firm petioles

1.2 Recommended Plant species

Based on nature of pollutants following tree species are recommended to be planted

S. No.	Plant Species	Common Name	Habit
1.	Termanilia catappal	Jagali Badam	Tree
2.	Anthocephalus cadamba	Kadam	Tree
3.	Ficus bengalensis	Badh	Tree
4.	Magnifera indica	Aam	Tree
5.	Tectona grandis	Teak	Tree
6.	Ficus religiosa	Peepal	Tree
7.	Hibiscus rosa sinensi	Hibiscus	Shrub
8.	Wrightia arboriea	Dudhi	Shrub
9.	Tabernaemontana divaricata	Chandani	Shrub

S. No.	Plant Species	Common Name	Habit
10.	Bougainvillea glavra	Bougainvillea	Shrub
11.	Codium variegates	Cockscomb	Herb
12.	Celosia argentea	Croton	Herb
13.	*Ilex rotunda*	Kurogane holly	Tree
14.	*Cassia surattensis*	Golden Senna	Tree
15.	*Cinnamomum camphora*	Camphor tree	Tree
16.	Lagerstroemia flos-reginae	Lagerstroemia	Tree
17.	Alstonia scholaris	Devil tree	Tree
18.	Cassia fistula	Golden shower	Tree
19.	Delonix regia	Gulmohar	Tree
20.	Pongamia pinnata	Indian beech	Tree
21.	Terminalia arjuna	Arjun	Tree
22.	Terminalia belerica	Baheda	Tree
23.	Butea superb	Tesu	Tree
24.	Cassuarina sp.	Cassuarina	Tree
25.	Bahunia acuminate	White orchid green	Tree
26.	Swetania mohogini	Cuban Mahagony	Tree
27.	Azadiracta indica	Neem	Tree
28.	Artocarpus integrifolia	Jackfruit	Tree
29.	Gmelina arborea	Gamhar	Tree
30.	Putranjiba roxburghii	Putranjiba	Tree

1.3 Plantation Methodology

Components of green belts on roadside fence should be both absorbers of gases as well as of dust particles, including even lead particulates. Thus the choice of plants should include pollution tolerant shrubs of height 1 to 1.5 m and trees of 3 to 5m. The intermixing of trees and shrubs should be such that the foliage area density in vertical is almost uniform. For effective removal of pollutants, it is necessary that (i) plants should grow under conditions of adequate nutrient supply, (ii) absence of water stress and (iii) plants are well exposed to atmospheric conditions (light & breeze).

Multiple rows of green belt shall be developed. Green belt should be pyramidal in shape.

Plantation pattern shall be kept as given below:

- Short trees and tall shrubs shall be planted as first row (from road) followed by tall tree plantation which will be followed by another row of medium and small trees and tall shrubs.
- Planting of trees should be in appropriate encircling rows, each rows alternating the previous one to prevent further fanning and horizontal pollution dispersion;
- Since tree trunks are normally devoid of foliage, it would be appropriate to have small shrubs in front and in between the tree spaces;

- The open areas between the process installations where trees cannot be planted should be covered with lawn grasses for effective trapping and absorptions of air pollutants.
- Fast growing trees with thick canopy and perennial foliage should be selected so that the effective tree height with envisaged objective will be attained in minimum span of time

1.4 Plantation Pattern

A standard horticultural practice involving planting of saplings in pits of substantial dimensions i.e., 1m × 1m × 1m for big trees and along half of these dimensions for smaller trees and shrubs. The pits are then filled with earth, sand, silt and manure in pre-determined proportions. Saplings planted in such pits are watered liberally during dry months.

1.5 Time of Plantation

Plantation of the tree sapling should be done only after the first shower during the rainy season. The best time for plantation is after 15 days from the day of first shower during rainy season.

1.6 Protection of Tree saplings

Circular tree guard should be placed after the plantation of the saplings for the protection of these young plants from the ravages of cattle, sheep and goat and other animals. If tree saplings died or damage occur after placing the circular tree guard, timely replacements of damaged plant and thereafter care is important.

1.7 After Care & Monitoring

The growing plants are cared at least for the first two years under favourable conditions of climate and irrigation. Nutrients in pits are supplemented and the juveniles provided protection.

Thinning shall start after the stand is 3-4 years old and repeated every 4 years until the stand is 15 years old. Between 15-25 years old, thinning should be conducted every 5 years and after 25 years old, thinning shall be done after every 10 years. When the canopy closes, at about 6 years, 30-40% of the stems shall be thinned to selectively remove suppressed, diseased and badly formed trees.

Periodic assessment shall be carried for survivability of the trees. Minimum 70% survival rate shall be achieved.

1.8 Records Keeping & Reporting

The following records shall be maintained:

1. Record of Tree plantation
2. Record of Survivability rate

Inspection shall be carried out at site to know the survival rate of the plantation. The tree plantation and survivability report shall be prepared every six monthly.

1.9 Responsibility

Compensatory plantation shall be carried out by forest department. Survival rate of plantation shall be inspected of the by IWAI. Plantation within the terminal/jetty/lock site shall be carried out by IWAI and shall be monitored by IWAI.

Annexure 1.2: Occupational Health & Safety Management Plan

1.0 Introduction

Many emergencies can occur on any construction site and need to be effectively handled. The environmental and occupational health and safety aspects and related emergency can include incidence such as Collapse / subsidence of soil / Fire / Explosion / Gas Leak, Collapse of Building / Equipment and other Occupational Accidents. On site and off site emergency management plan shall be developed to effectively handle them.

Thus every contractor shall have an approved on-site emergency plan. The contractor should submit a copy of this plan to PIU and Supervision consultant before the start of the work. Contractor shall develop the onsite emergency plan considering the potential environmental, occupational health and safety emergency situation at site and activities involved. This plan shall include a list of these potential emergency situations in the onsite emergency preparedness & response plan. Contractor shall get the plan approved from IWAI/PMC

1.1. Anticipated Emergencies at Construction Site

The potential emergency situations have been defined below for guidance purposes. The contractors can follow these for developing site specific on site emergency preparedness plan.

Emergency conditions / situations	Sources
Collapse / subsidence of soil	▪ Civil structures
Bulk spillage	▪ Hazardous substance / inflammable liquid storage ▪ Vehicular movement on highway
Fire and explosion	▪ Inflammable Storage Areas ▪ Gas Cylinder Storage Areas ▪ Electrical Circuits ▪ Isolated Gas Cylinders (LPG / DA) ▪ Welding / Gas Cutting Activity
Electrical Shock	▪ HT line ▪ LT distribution ▪ Electrically Operated Machines / Equipment / Hand Tools / Electrical Cables
Gaseous Leakage	▪ Gas Cylinder Storage Areas ▪ Gas Cylinder used in Gas Cutting / Welding Purposes

Emergency conditions / situations	Sources
Accidents due to Vehicles	▪ Heavy Earth Moving Machinery ▪ Cranes ▪ Fork Lifts ▪ Trucks ▪ Workman Transport Vehicles (cars / scooters / motor cycles / cycles) ▪ Collapse, toppling or collision of transport equipment
Slips & Falls (Man & Material)	▪ Work at Height (Roof Work, Steel Erection, Scaffold, Repair & Maintenance, Erection of equipment, Excavation etc.) ▪ Slips (Watery surfaces due to rain) ▪ Lifting tools & Tackles (Electric Hoist & Forklifts)
Collision with stationary/ moving objects	▪ Vehicular movement
Other Hazards	▪ Cuts &Wounds ▪ Confined Space (under & inside machinery etc.) ▪ Hot Burns ▪ Pressure Impacts (Plant contains several Pressure Vessels & pipefitting containing CO_2, air, water, product & steam, which can cause accidents & injuries to person around.)

1.2. Design of 'On-Site Emergency Plan'

The 'On-site emergency plan' to be prepared by contractor and shall include minimum the following information:

- Name & Address of Contractor
- Updation sheet
- Project Location
- Name, Designation & Contact Numbers of the organization, nearby hospitals, fire agencies etc. and key personnel including their assigned responsibilities in case of an emergency.
- The roles and responsibilities of executing personnel
- Site Layout Diagram showing location of fire extinguishers, emergency collection area and fire alarm
- Identification of Potential Emergencies Situations/ preventive measures / control & response measures
- Location of Emergency Control Centre (or designated area for emergency control / coordination) with requisite facilities.
- Medical services / first aid
- List of emergency equipment including fire extinguishers, fire suits etc.

1.3. Emergency Control Centre

The emergency control centre shall be equipped with following facilities

- Copy of current on-site emergency plan
- Display of the name of site emergency controller
- Two numbers of artificial respiratory sets
- Two numbers of Stretchers
- Vehicle for 24 hours (for large construction sites)
- Inter personnel/section telephone (2 numbers)
- Site layout diagram with entry and exit routes / Assembly points
- Directory of internal / external emergency phone Numbers
- A set of fire extinguishers (DCP type / Foam Type / CO2)
- List of fire extinguishers installed in the construction site including maintenance record
- A set of personal protective equipment (PPE)
- Two numbers of first-aid boxes with prescribed first-aid medicines
- List of competent first-aiders
- List of fire trained personnel
- Two numbers of blankets
- Drinking water
- Two numbers of rescue ropes
- Two numbers of high beam torches
- Two numbers of gas leak detectors
- Life boat & jackets (if working in or near water course)

1.4. Records

The following records shall be maintained:

1. Record of emergency preparedness plan with emergency contact numbers
2. Mock drill/emergency preparedness exercise records
3. Corrective preventive action record after emergency is occurred

1.5. Reporting

The accident and incident records and emergency preparedness drill reports shall form part of quarterly report to EA

1.6. Responsibility

Contractor shall be responsible to handle emergency condition and shall be liable to compensate the damage against accident, if any occurs at site.

Annexure 1.3: Construction Debris Management Plan

INTRODUCTION

Waste will be generated from the construction site and labour camps during the construction phase. Type of the waste to be generated during construction phase is given below.

Excavated Soil

Site is undulating and thus will require cut & fill for levelling. Finished level of the soil will be 37 m. Top excavated soil of 15 cm shall be stripped and shall be stored separately under covered sheds. This soil shall be used for green belt plantation.

Lower layers of excavated soil shall be re-used within the site for flling purpose, construction of approach & internal roads & railway link. If any extra soil is remained, then that should be disposed of to the approved debris disposal site

Dredged Material

Dredging shall be carried out in the river for construction of off-shore structures like jetty & berths (pilling) and navigation channels. Dredged soil shall not be disposed along the river bank as they are sensitive habitat for various aquatic species and provide as the spawning and breeding grounds also. Dredged material shall be tested for its quality. If non-toxic then should be disposed at disposal site but if toxic & contains heavy metals, then it should be disposed to TSDF site.

Construction Waste

Construction waste will comprise of broken bricks, dry cement, discarded timber, metal piece, cement bag, dry asphalt/bitumen, glass, paint/varnishes box etc. These wastes should be segregated into recyclable and non-recyclable waste. Recyclable waste shall be stored in the covered area and shall be sold to authorized vendors regularly. Non-recyclable waste shall be disposed at approved debris site in covered vehicles.

Municipal Waste

Municipal waste will be generated from labour camp. Dustbins for recyclable and non-recyclable waste shall be provided in labour camp area. Recyclable waste shall be sold to authorized vendors and non-recyclable shall be disposed through authorized agency in area responsible for waste collection and management.

Waste generated requires proper management so as to minimize the negative impacts on environment. Concept of reduce, re-use and recycle shall be followed at site. The rejected waste should be disposed in a secured manner. Thus a site should be identified for disposal of the rejected waste.

1.1 SELECTION OF DISPOSAL SITES:

The locations of Disposal sites have to be selected such that:

- Disposal sites are located at least 1000 m away from sensitive locations like settlements, water body, notified forest areas, wildlife/bird/dolphin sanctuaries or any other sensitive locations.
- Disposal sites shall not contaminate any water sources, rivers etc so the site should be located away from water body and disposal site should be lined properly to prevent infiltration of water.
- Public perception about the location of debris disposal site has to be obtained before finalizing the location.
- Permission from the village/local community is to be obtained for the Disposal site selected.
- Environment Engineer of PMC and Executive Engineer of Contract Management Unit must approve the Plan before commencement of work.

1.2 PRECAUTIONS TO BE ADOPTED DURING DISPOSAL OF DEBRIS / WASTE MATERIAL

The Contractor shall take the following precautions while disposing off the waste material.

- During the site clearance and disposal of debris, the Contractor will take full care to ensure that public or private properties are not affected, there is no dwellings around the dumpsite and that the traffic is not interrupted.
- The Contractor will dispose debris only to the identified places or at other places only with prior permission of Engineer-in-Charge of works.
- In the event of any spoil or debris from the sites being deposited on any adjacent land, the Contractor will immediately remove all such spoil debris and restore the affected area to its original state to the satisfaction of the Engineer-in-Charge of works.
- The Contractor will at all times ensure that the entire existing canal and drains within and adjacent to the site are kept safe and free from any debris.
- Contractor will utilize effective water sprays during the delivery and handling of materials when dust is likely to be created and to dampen stored materials during dry and windy weather.
- Materials having the potential to produce dust will not the loaded to a level higher than the side and tail boards and will be covered with a tarpaulin in good condition.
- Any diversion required for traffic during disposal of debris shall be provided with traffic control signals and barriers after the discussion with local people and with the permission of Engineer-in-Charge of works.
- During the debris disposal, Contractor will take care of surrounding features and avoid any damage to it. The debris should not be disposed along the bridges & culverts and near the water bodies.
- While disposing debris / waste material, the Contractor will take into account the wind direction and location of settlements to ensure against any dust problems.
- Contractor should display the board at disposal site stating the name of project, usage of the site and type of debris being disposed.
- A guard shall be kept at disposal site to prevent any unauthorized disposal of waste at the debris disposal site
- Material should be disposed through covered vehicles only

- No contaminated/hazardous/e-waste shall be disposed at the debris disposal site

1.3 RECORD KEEPING

Site approved by site engineer only can be used as disposal site. Record of all such site should be maintained along with the area of disposal site, type & quantity of material disposed daily and capacity of disposal site.

1.4 GUIDELINES FOR REHABILITATION OF DISPOSAL SITES

The dumpsites filled only up to the ground level could be rehabilitated as per guidelines below and to be decided by the Engineer and the supervision consultant.

- The dumpsites have to be suitably rehabilitated by planting local species of shrubs and other plants. Local species of trees has also to be planted so that the landscape is coherent and is in harmony with its various components.
- In cases where a dumpsite is near to the local village community settlements, it could be converted into a play field by spreading the dump material evenly on the ground. Such playground could be made coherent with the landscape by planting trees all along the periphery of the playground.
- Closure of the disposal site should be upto the satisfactory level of site engineer

1.5 PENALTIES

Stringent action & penalties should be imposed off on contractor for dumping of materials in locations other than the pre-identified locations. Grievance Redressal mechanism should be in place for taking note and action on such complaints.

Annexure 1.4: Construction and Labour Camp Management Plan

1.0 Objective of the Plan

The objective of this plan is to provide guidance to the contractor or other agency involved in setting up of the construction and labour camp for keeping the health & Safety of workers and impacts of setting up such camps on the local community in consideration while developing and establishing such camp. This plan is prepared in reference to the Workers accommodation: processes and standards (A guidance note by IFC and EBRD). The plan aims to promote "safe and healthy working conditions, and to protect and promote the health of workers."

2.0 Selection and layout of construction camp

Labour camps, plant sites and debris disposal site shall not be located close to habitations, schools, hospitals, religious places and other community places. A minimum distance of 500 m shall be maintained from the habitations, sensitive locations like temple, school & hospitals, forest areas and other eco-sensitive zones for setting up such facilities.

3.0 Facilities at workers' camps

During the construction stage of the project, the construction contractor will construct and maintain necessary (temporary) living accommodation, rest area and ancillary facilities for labour. Facilities required are listed and elaborated below.

- Site barricading
- Clean Water Facility
- Clean kitchen area with provision of clean fuel like LPG
- Clean Living Facilities for Workers
- Sanitation Facilities
- Waste Management Facilities
- Rest area for workers at construction site
- Adequate Illumination & ventilation
- Safe access road is required at camps
- Health Care Facilities
- Crèche Facility & Play School
- Fire-fighting Facility
- Emergency Response Area

3.1 Attendance& Working hours

Supervisor of the camp should take the attendance of the employee at each camp twice in a day (morning and evening) and should maintain the record. Further work hours of the workers should be maintained in accordance to the labour law and as mentioned in the labour licence. All workers should be provided with ID card and entry to the site should be through ID card only and should be ensured by security guard.

3.2 Site Barricading

Site should be completely barricaded from all the sides to prevent entry of outsiders and animals into the site. Entry gate should be provided at the site and labour camp which should be guarded by security guard. All workers should be issued ID cards and entry of outsiders shall be maintained in the register at the gate. Board should be displayed at the site and the labour camp, the name of project, capacity of project, authority carrying our projects, restriction of entry without authorization, no smoking zone and associated risks. Plant operation shall be restricted to 6:00 Am to 10:00 PM

3.3 Clean Water Facility

Potable water shall be provided for construction labour for drinking & cooking purpose. Clean water shall be provided for bathing, cleaning and washing purpose. Water quality testing for drinking water provided for workers shall be carried out on monthly basis. Water dispensers should be cleaned on monthly basis. Adequate water per person should be provided at site for drinking, cooking, barhing, cleaning and other use purpose

3.4 Clean Kitchen Area

Provision of clean kitchen area for cooking and storage of eatables shall be provided. Clean fuels like LPG shall be provided for cooking purpose. Burning of firewood, garbage, paper and any other material for cooking or any other purpose shall strictly be prohibited at the site. Separate utensil washing area should be provided with proper drainage system. Kitchen waste should be daily cleaned and disposed off. Water storage facility at kitchen should be covered and cleaned on monthly basis. Kitchen area should be away from washing, toilets and bathing area.

Wall surfaces adjacent to cooking areas are made of fire-resistant materials. Food preparation tables are also equipped with a smooth durable washable surface. Lastly, in order to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures and all walls and ceilings have a smooth durable washable surface.

3.5 Clean Living Facility for the Workers

Workers should be provided with proper bedding facility. Single bed should be provided to each workers and each bed should be at least 1 m apart from another. Double deck bedding should be avoided, in case provided, adequate fire-fighting facility should be provided. Bed linen should be washed regularly and should be applied with repellent and disinfectants so as to manage the diseases caused due to pests. Facilities for storage of personal belongings for workers should be provided in form of locker, shelf or cupboard. A separate storage area for the tools, boots, PPE should be provided. Proper ventilation through mechanical systems and lighting system should be ensured in construction camps.

3.6 Sanitation Facilities

Construction camps shall be provided with sanitary latrines and urinals. Toilets provided should have running water availability all the time. Bathing, washing & cleaning areas shall be provided at the site for construction labour. Washing and bathing places shall be kept in clean and drained condition. Adequate nos. of bathing & toilet facility should be provided at site and should not exceed 1 unit per 15 person. Toilets and bathing

facility should be closed to the camps. Workers shall be hired especially for cleaning of the toilets and bathing area. Septic tanks and soak pits shall be provided at site for disposal of the sewage generated. The toilets should be cleaned on daily basis. These tanks should be evacuated through authorized vendors if filled and at the time of closure. Pest management should be carried out at the camps if the area is infected by any pests. Adequate lighting should be ensured in camp area especially during night time. The area should be guarded by security guard to minimize the crime and thefts.

3.7 Waste Management Facilities

Waste generated should be segregated at the site by providing the different colour bins for recyclable and non-recyclable waste. Recyclable waste shall be sold to authorized vendors and non-recyclable shall be handed over to authority responsible in area for waste management. Waste management for construction site shall be as per waste management plan proposed in EMP. Waste management area should be cleaned on regular basis to avoid germination of flies, mosquitoes, rodents and other pests.

3.8 Rest Area for Workers at Site

A rest area/shelter shall be provided at the site for construction workers where they can rest after lunch time and shall not lay down at site anywhere. The height of shelter shall not less than 3m from floor level to lowest part of the roof. Sheds shall be kept clean and the space provided shall be on the basis of at least 1.0 Sq. m per head.

3.9 Adequate Illumination & Ventilation

Construction worker camps shall be electrified and adequately illuminated. Illumination level shall be maintained after 5.30 P.M. at the site to minimum 200 lux. Labour camps shall be adequately ventilated. Fans shall be provided for ventilation purpose.

3.10 Safe Access Road for Labour Camps

Temporary paved surface shall be constructed to approach the labour camp from the site. Movement shall not be hampered during monsoon season due to water logging and muddiness.

3.11 Health care Facilities:

First aid box, first aid room and personnel trained in first aid (certified first-aider) shall be available at labour camp and site all the time (24X7). Equipment in first-aid box shall be maintained as pet State Factory's Law. Ambulance/ 4 wheeler motorized vehicle shall be available at the site for carrying injured to the nearby hospital. Tie-ups should be made with nearby hospital to handle emergency, if any. Nos. of ambulance, doctors and nearby hospital s hall be displayed in first-aid room, site office & labour camps. List of contact nos. of emergency personnel, hospitals, fire brigade and other emergency contact should be displayed at camp site, guard's room and first aid room. Workers shall be made aware about the causes, symptoms and prevention from HIV/AIDS through posters and awareness programs. Workers shall have access to adequate preventive measures such as contraception (condoms in particular) and mosquito nets.

3.12 Crèche Facility & Play School

Crèche facility and play school should be constructed at the site temporarily so as children of construction labour can be kept there. Care takers should be hired for taking care of children. Attendance records of children shall be maintained. Children should not be allowed to enter active work areas.

3.13 Fire-Fighting facilities

Fire-fighting facility such as sand filled buckets and potable fire-extinguishers shall be provided at labour camps and at site. Fire-extinguishers shall be provided as per NBC norms. Personnel trained in handling fire-fighting equipment should be available at the site. Fire evacuation plan should be displayed at the site and should be communicated to all the workers and other staff at camp site.

3.14 Emergency Assembly Area

Area shall be demarcated as emergency collection area near the gate where all the workers shall be guided to collect in case of any emergency like fire, flood and earthquake.

4.0 Activities prohibited at site

Activities which should be strictly prohibited at site shall include

- Open burning of wood, garbage and any other material at sit for cooking or any other purpose
- Disturbance to the local community.
- Adoption of any unfair means or getting indulgence in any criminal activity
- Non-compliance of the safety guidelines as communicated be safety officials and during the trainings
- Adoption and proper usage of PPEs all the time as required
- Operation of the plant and machinery between 10 pm to 6 am unless approved by team leader
- No animal (wild or domestic or bird) shall be harmed by any construction worker in any condition at site and nearby areas
- Cutting of tree without permission of team leader/authorized person
- No indigenous population shall be hurt or teased

5.0 Guidelines for night time working at the site.

No activity generating noise shall be carried out at the site after 10:00 PM. Night working protocol should be followed (if required) as per guidelines prepared by IWAI. Site should be well illuminated to maintain minimum illumination level of 200 lux. Personnel working shall obtain permit to work from the team leader prior carrying out any work in night time and the record of such working shall be maintained in register. Any accidents, if occurs at site during night time working shall be immediately reported and recorded. Penalty shall be imposed on the contractor for the accident. Analysis shall be carried out to find the reason for such accidents for future learning.

6.0 Record keeping & Maintenance

Record of entry/exit of the people in the construction site and labour camp area shall be maintained in register at gate. Record of material coming in and going out from site also shall be maintained.

7.0 Auditing & Inspection

Conditions of labour camp and site shall be inspected and audit report shall be submitted to IWAI on monthly basis.

8.0 Grievance readressal System

CA complaint register and a complaint box should be provided at the site so any person from local community can register their complaint, if any due o the camp, workers and other facilities. The system shall be communicated to local communities through consultations. Open house meetings should be conducted with workers on monthly basis to identify their problems and issues if any related p health, hygiene, safety, comfort and other issues.

9.0 Security System

Site should be barricaded and should be guarded by security guards at all the gates. Security guards should allow only authorized personnel to the campsite. Guards should be available during both morning and night time. Guard should allow entry of workers to the site only be seeing the ID cards. Guard should report if any unusual or unfair practise happening at site and nearby area. Guards should be trained to handle emergency situations like fire-fighting and should be responsible to contact the emergency personnel in case of any emergency.

10.0 Closure of the Construction Site and Construction labour Camps

Construction site and labour camps shall be restored back to the original site conditions. Following measures are required to be taken during closure

1. Septic tanks/soak pits should be dismantled
2. Any temporary/permanent structure constructed shall be dismantled
3. Construction/demolition waste, hazardous waste and municipal waste at site and labour camp site shall be disposed as per waste management plan in EMP
4. The site shall be cleaned properly
5. Tree plantation to be carried out, if any required for stabilizing the area
6. Any pit excavated shall be filled back
7. Closure of the site and labour camp shall be approved by authorized person.

Annexure 1.5: Borrow Area Management Plans

1.0 Introduction

Borrow areas will be finalized as identified by Contractor as agreed by the PMC and IWAI as per the requirements of the contract. Environment clearance under EIA Notification, 2006 from competent authority and NOC from state pollution control board under Air Act, 1981 as applicable shall be obtained by contractor prior excavation. Consent from land owners and DC of the area shall also be taken prior undertaking any excavation. The Contractor in addition to the established practices, rules and regulation will also consider following criteria before finalizing the locations. Contractor should submit borrow area establishment plan along with the locations marked in map and the environmental settings of the planned area to PMC/IWAI for approval of the "Engineer" through RFI.

1) The borrow area should not be located in agriculture field unless unavoidable i.e. barren land is not available.
2) The borrow pits should not be located along the roads, close to project site
3) The loss of productive and agricultural land should be minimum.
4) The loss of vegetation is almost nil or minimum.
5) Sufficient quality of soil is available.
6) The Contractor will ensure the availability of suitable earth.

The Contractor shall obtain representative samples from each of the identified borrow areas and have these tested at the site laboratory following a testing programme as approved by the concerned Engineer. It shall be ensured that the fill material compacted to the required density. The Contractor shall submit the following information to the Engineer for approval at least 7 working days before commencement of compaction.

- The values of maximum dry density and optimum moisture content obtained in accordance with ARE: 2720 (Part 7) or (Part 8), as the case may be, appropriate for each of the fill materials he intends to use.
- A graph of density plotted against content from which, each of the values in (i) above of maximum dry density and optimum moisture content are determined.
  After identification of borrow areas based on guidelines and full filling the following requirements are to be fulfilled
- Quantification of Earth
- Land Agreement
- Clearance from local authorities
- Environmental Clearances from SEIAA should be obtained. All EC conditions are to be followed by contractor and contractor should submit EC to IWAI/PMC/PMU

After receiving the approval Contractor will begin operations keeping in mind following:

- Haulage of material to the areas of fill shall proceed only when sufficient spreading and compaction plants are operating at the place of deposition.
- No excavated acceptable material other than surplus to requirements of the Contract shall be removed from the site. Contractor should be permitted to remove acceptable material from the site to suit his operational procedure, then be shall make good any consequent deficit of material arising there from.
- Where the excavation reveals a combination of acceptable and un-acceptable materials, the Contractor shall, unless otherwise agreed by the Engineer, carryout the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the un-acceptable materials. The acceptable material shall be stockpiled separately.
- The Contractor shall ensure that he does not adversely affect the stability of excavation or fills by the methods of stockpiling materials, use of plants or siting of temporary buildings or structures.

1.1 Borrow Area Management

Borrow areas located in different land will require different management. Management measures to be taken in different land types are given below.

1.1.1 Borrow Areas located in Agricultural Lands

- The preservation of topsoil will be carried out in stockpile.
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- Borrowing of earth will be carried out up to a depth of 1.5m from the existing ground level.
- Borrowing of earth will not be done continuously throughout the stretch.
- Ridges of not less than 8m widths will be left at intervals not exceeding 300m.
- Small drains will be cut through the ridges, if necessary, to facilitate drainage.
- The slope of the edges will be maintained not steeper then 1:4 (Vertical: Horizontal).

1.1.2 Borrow Areas located in Agriculture Land in un-avoidable Circumstances:

- The preservation of topsoil will be carried out in stockpile.
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside.

1.1.3 Borrow Areas located on Elevated Lands

- The preservation of topsoil will be carried out in stockpile

- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- At location where private owners desire their fields to be levelled, the borrowing shall be done to a depth of not more than 1.5m or up to the level of surrounding fields.

1.1.4 Borrow Areas near Riverside

- The preservation of topsoil will be carried out in stockpile
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- Borrow area near to any surface water body will be at least at a distance of 15m from the toe of the bank or high flood level, whichever is more.

1.1.5 Borrow Areas near Settlements

- The preservation of topsoil will be carried out in stockpile
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- Borrow pit location will be located at least 0.75 km from villages and settlements. If un-avoidable, the pit will not be dug for more than 30 cm and drains will be cut to facilitate drainage.
- Borrow pits located in such location will be re-developed immediately after borrowing is completed. If spoils are dumped, that will be covered with layers of stockpiled topsoil in accordance with compliance requirements with respect MOEF&CC/CPCB guidelines.

1.1.6 Borrow Pits along the Roads

- The preservation of topsoil will be carried out in stockpile
- A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- Borrow pits along the road shall be discouraged.
- If permitted by the Engineer; these shall not be dug continuously.
- Ridges of not less than 8m widths should be left at intervals not exceeding 300m.
- Small drains shall be cut through the ridges of facilitate drainage.
- The depth of the pits shall be so regulated that its bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of the final section of bank, the maximum depth of any case being limited to 1.5m.
- Also, no pit shall be dug within the offset width from the toe of the embankment required as per the consideration of stability with a minimum width of 10m.

- Minimum distance from road/ railway should be 50 metres.

1.1.7 Re-development of Borrow Areas

The objective of the rehabilitation programme is to return the borrow pit sites to a safe and secure area, which the general public should be able to safely enter and enjoy. Securing borrow pits in a stable condition is fundamental requirement of the rehabilitation process. This could be achieved by filling the borrow pit approximately to the road level.

Re-development plan will be prepared by the Contractor before the start of work in line with the owner's will and to the satisfaction of owner.

The Borrow Areas will be rehabilitated as follows

- Borrow pits will be backfilled with rejected construction wastes (unserviceable materials) compacted and will be given a turfing or vegetative cover on the surface. If this is not possible, then excavation slope should be smoothened and depression is filled in such a way that it looks more or less like the original ground surface.
- Borrow areas might be used for aquaculture in case landowner wants such development. In that case, such borrow area will be photographed after their post-use restoration and Environment Expert of Supervision Consultant will certify the post-use redevelopment.
- The Contractor will keep record of photographs of various stages i.e. before using materials form the location (pre-project), for the period borrowing activities (Construction Phase) and after rehabilitation (post development), to ascertain the pre and post borrowing status of the area.