INLAND WATERWAYS AUTHORITY OF INDIA

Ministry of Shipping, Government of India

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT, ENVIRONMENTAL MANAGEMENT PLAN AND RESETTLEMENT ACTION PLAN FOR "CAPACITY AUGMENTATION OF NATIONAL WATERWAY.1" BETWEEN HALDIA AND ALLAHABAD

(JAL MARG VIKAS PROJECT)

(DRAFT)

ENVIRONMENTAL MANAGEMENT PLAN

FOR

FARAKKA LOCK

MAY, 2016

EQMS India Pvt. Ltd.

In JV with

IRG Systems South Asia Pvt. Ltd.

Abnaki Infrastructure Applications & Integrated Development Pvt. Ltd.

304-305, Rishabh Corporate Tower, Plot No. 16,
Community Center, Karkardooma, Delhi – 110092,
Phone: 011-30003200; E-mail : eqms@eqmsindia.org;
Website : www.eqmsindia.com

Table of Contents

List of Figures

List of Tables

List of Annexure

CHAPTER 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 Locks, 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 new lock is proposed to be developed at Farakka adjacent to the existing locks as one of the means of improving navigation in NW-1. Existing lock of Farakka is not working at optimal efficiency and it takes 2-3 hours to complete one operation there by reducing the possible nos. of ships which can cross through and ultimately the freight transportation efficiency. Maintenance of the existing lock would keep the lock in non-operational condition for entire maintenance period thereby stopping the movement of barges/vessels in that period. Thus IWAI has proposed to construct a new lock at Farakka to ensure efficient movement of vessels/barges. Location map of the project site is given in **Figure 1.1** below.

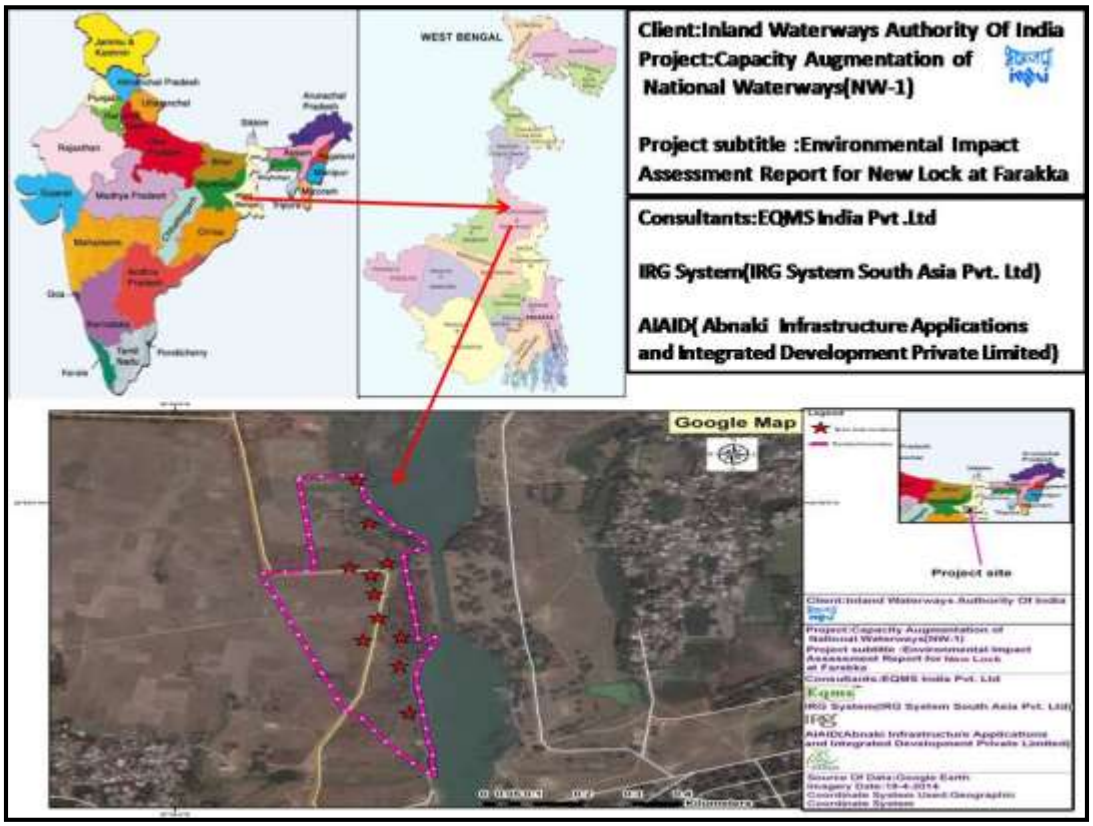

Figure 1.1 : Location Map

1.2. PROJECT BRIEF

New Farakka Lock is proposed to be developed at Farakka, District Murshidabad, West Bengal on River Ganga. Proposed project would be set up in 14.4 ha of transferred land of Farakka Barrage Project. Proposed site is being used for agricultural purpose by nearby villagers. Site is almost flat with gentle slope and elevation varies from 25-31m amsl. Project involves construction of lock which requires excavation of earth. Also leveling of site will be done to achieve finished level of 21 m which again will require earth cut and fill operations. It is estimated that 11.76 lakh cum of earth will be cut and out of this 4.13 lakh cum of earth will be filled and remaining of the soil requires to be disposed off in safe manner to prevent environmental pollution. Site is connected to NH-80 the road passing along western boundary of the proposed lock gate.

Lock is proposed to facilitate the movement of barges/vessels across the river with the significant level difference. There is no unloading and loading of material associated with lock facility. Components of the lock facility include counter fort retaining wall, inlet/outlet structure and base slab. Other developments include realignment of road connecting Farakka town to Rajmahal (FBP inspection road) of 675 m, boundary wall of length 1180 m and 2.4 m high around the lock site, internal roads and control room building.

1.3. ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

Effective measures are required to be proposed and implemented during design, construction and operation stage to eliminate or minimize the impact of the project development. **Table 1.1** & **1.2** 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 air quality, surface water quality, drinking water quality, noise levels, soil quality, erosion & siltation, green belt, aquatic ecology and integrity of embankment. has been defined and included under respective head at **Table 1.3**.

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.

1.4. 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.

1.5. 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

analyze the report and notify the corrective action if any required to contractor under intimation to IWAI.

Table 1.1 : Environment Management Plan of Farakka Lock During Design and Construction Phase

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
DESIGN AND CONSTRUCTION PHASE							
1. Climate							
❖ Project is unlikely to cause negative effect on climate. However, project can contribute positively for climate	• No tree cutting shall be carried out without obtaining permission from Forest department • Greenbelt should be developed all around the boundary of the project. 1 ha of land will be reserved for green area at the site. 900 trees should be planted within the project site. Trees at the site shall be retained as green belt. • Provision of alternative energy options like solar energy • Adoption of best practices to cut down resources and energy requirement like adoption of water conservation measures, energy conservation measures etc.	Kyoto Protocol, National Water Policy, 2012 & National Forest Policy	Construction site	During Design, and construction stage.	Green belt Plantation For 900 trees	Contractor,	IWAI/PMU /PMC[1]
2. Natural & Man-made Hazard							

[1] It is proposed to set up Social and Environmental Management Unit (PMU) 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
❖ Earthquake-Seismic Zone –III damage risk zone[2] ❖ Risk of flood	• Adoption of Relevant IS codes while designing the civil onshore & off-shore structures to sustain the earthquake of moderate to high magnitude. • Designing of structures above the HFL (High Flood Level) of river/canal • Preparation of emergency preparedness and response plan for natural and man-made hazards like earthquake, floods, fires, shocks, explosion of hazardous materials etc.	NBC, 2005, local building bye laws, state factory rules, Petroleum Rules and MSIHC Rules, 1989	Construction site & Navigation Channel	During Design and construction stage.	Part of Project Costs	Contractor	IWAI/PMU /PMC
3. Site Preparation: Levelling Lock Gate Site, Construction Camp, Construction Works							

[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
❖ Leveling of lock gate site & Removal of vegetation	• Tree cutting is not anticipate at present however if any tree cutting required, it should be carried out only after obtaining NOC from forest department. • Excavation and filling operations should be carried out in parallel so as to minimize the soil erosion • Water sprinkling to be carried out for dust suppression • Top soil (15 cm) should be stripped and preserved under covered conditions for landscaping purpose in later stage. This should be stored in the form of the heap with the slide slopes covered with grass. Excavated soil should be used within the site for filling purpose and and for realignment of the existing road. Any surplus soil should be disposed off to safe location/identified debris disposal site approved by IWAI within 5 kms of project site. • Contractor should submit a plan prior excavation to the IWAI for management and disposal of the surplus earth. • Green belt should be developed at the site and as per the Green Belt	Municipal Solid Wastes (Management and Handling) Rules, 2015 Social Impact Assessment requirements Forest Act, 1927 & Amendments	Construction site	During design and Construction Stage	Part of Project Costs	Contractor.	IWAI/PMU /PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	Management Plan (**Annexure 1**). • Survival rate of tree should be regularly monitored. It is should be minimum 70%. • Work timings should be restricted from 6:00 AM to 10:00 PM. Adequate illumination should be provided at site during evening hours • Rest area should be provided for workers at site and sleeping/lying down at site should be strictly prohibited • Safety guidelines as per operation, health & safety management plan **(Annexure 2)** should be followed **Municipal Solid Waste Management:** • Excavated soil should be stored in covered conditions only • Arrangement should be made for segregation of waste into recyclable and non-recyclable waste • Non-recyclable waste generated should be disposed regularly through authorized agency. Recyclable waste should be sold to authorized vendors. • Construction waste generated should be segregated at site into recyclable, reusable & rejected						

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	fraction. Recyclable should be sold to authorized vendor, reusable waste should be stored at site for usage and rejected fraction should be disposed at designated sites by the municipal authority • If no debris or waste disposal site exists in the area then a site should be identified for debris disposal, should be approved by IWAI and should be used & manage for the same as per the Debris Management Plan **(Annexure 3)**						
❖ Setting of Labor Camps: Loss of agriculture land, contamination of land and water resources from municipal waste from Camps, worker's	**Location of Camp:** • Construction camp siting, establishment, location and management should be as per proposed Construction & Labour Camp Management Plan **(Annexure 4)** • Labour camps should be located close to the construction sites to the extent possible **Sanitation and Worker's Health:** • Hygiene in the camps should be maintained by providing good sanitation and cleaning facilities. Soak Pits can be provided only if	The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 and Cess Act of 1996 and The Water (Prevention & Control of Pollution) Act, 1974 and	Labour Camp Locations	During design and Construction Stage	For camp for sanitation and health facilities.	Contractor.	IWAI/PMU /PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
health, Pressure on natural resources due to establishment of labour camps	labour camp is located away from river. • Camp should be well ventilated. It should have adequate provision for illumination, kitchen and safe drinking water facility. Proper drainage to be maintained around the sites to avoid water logging leading to disease • Preventive medical care to be provided to workers • Segregated, collection and disposal of solid waste on regular basis at identified municipal solid waste disposal location. If municipal solid waste site not available than waste should be land fill following the regulations. • Provision should be made essential material supply like cooking fuel (gas) • Provision should be made for day crèche for children	amendments thereof. Municipal Solid Wastes (Management and Handling) Rules, 2000					
❖ Setting up construction Camp: Concert Mix Plant, Hot	• All these facilities should be installed at proposed lock gate site itself. In case these are to be set up away from site than these should be located at minimum distance of 500 m from habitation, water bodies.	Air (Prevention and Control of Water Pollution) Act, 1981 and Water	Site construction Camp	During design and construction Stage	For camp sanitation an health facilities.	Contractor.	IWAI/PMU /PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
Mix Plant, Mechanical Workshop, Fuel storages, Lubricant storages	• All maintenance facilities, hot mix plant and concrete mixing plant should be established with prior consent to establish to be obtained from SPCB. • All such equipment/plant should be fitted with air pollution control system and should comply with condition of consent to establish. • Periodic monitoring should be carried as per consent conditions.	(Prevention and Control of Water Pollution) Act, 1974					
4. Site Preparation: Power supply, Water Supply, and Drainage, disposal of muck and debris							
❖ Power supply and Energy Conservation : Air Pollution, energy loss	• Power should be sourced from State electricity board in the area during construction stage as well operation phase. • DG sets should be used only in case of power failure • Back-up power should 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 should be used in the project. • Energy Conservation Building Code should be used as applicable to various office and other structures.	Air (Prevention and Control of Water Pollution) Act, 1981 & ECBC Norms, 2007	Construction Sites and Labour Camp Locations	During design and construction stage	Part of Project Costs	Contractor.	IWAI/PMU /PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
❖ Water Supply, Drainage and effluent discharge	• Supply water shall be used for drinking water. • Water required for construction should be sourced from river for which necessary permission should be obtained. • Caution sign should be placed at site for optimal use of water • Garland storm water temporary drains should be developed around the site to prevent any direct discharge of contaminated or soiled water to river. It should be passes through de-siltation chamber and water collection pit. Collected water should be used for construction purposes. • All washing and maintenance effluent from the workshop area of vehicle maintenance area should Darin to separate collection areas fitted with oil and grease trap and de-siltation chamber. The treated water should be used for dust separation and green belt development. This water should not be discharged to river at all.	Central Ground Water Board, Water (Prevention and Control of Water Pollution) Act, 1974	Construction Sites and Labour Camp Locations	During design and construction stage	For construction of grease traps and de-siltation chambers	Contractor.	IWAI/PMU /PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
❖ Disposal of excavated earth, muck and debris: uncontrolled disposal may leads to increased sedimentation of the river.	• Provision should be made for collection and draining of water from the excavated earth. It should be used for embankment protection or road construction depending on its suitability. • Provision should be made for geo Synthetic Screen for arresting silt flowing down stream.	Solid Waste (Management & Handling) Rules, 2015	River Bank along the lock gate site	Pre-Construction and construction Stage	Part of Project Costs	Contractor.	IWAI/PMU /PMC
5. Embankment Design and Construction, Drainage Pattern							
❖ Navigational channel Bank Erosion Protection: Construction of Embankment and construction of inlet and out let structure: may lead to accumulation of sediments on the updrift	• Stone pitching should be provided on left bank of the River for protection • The river bank slope of U/S and D/S approach channel should be provided with two layers of pitching with PCC blocks of size of 1 m x 1m x 0.6 m. 6 m wide. • Guide walls on U/S and D/S of the lock are tied to those of existing lock and cut offs to a depth of 5 m have been provided for protection against scour • During block pitching, the block should be placed at suitable distance and should not by dropping from height. Block should	Water (Prevention and Control of Water Pollution) Act, 1974	1500-meter stone pitching River Bank along the lock gate site & 40 m apron inside the river	During design, Pre-Construction and construction Stage	Part of Project Costs	Contractor.	IWAI/PMU /PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
side and erosion of the downdrift side . Contamination of river water quality and land may happen due to river bed material	be placed by making grid in pitching area. • Erosion monitoring should be carried out periodically downstream as well. • River Bed material/dredged soil if any should be tested for contaminants before its use or disposal for land fill site. If any level of heavy metal contamination is found than it should be disposed off in a secure manner to TSDF.						
❖ Drainage Pattern	• Natural Drainage pattern of area around should be maintained. • Storm water management drains should be provided at site for management of storm water management		Construction Sites, Access road, and Labour Camp Locations	During construction stage	Part of Project Costs	Contractor.	IWAI/PMU /PMC
6. Construction Material Sourcing							
❖ Borrow areas for sourcing earth for filling as required (erosion, loss of productive	As surplus soil is available from excavation of the site, no borrow area may be required.	IRC Guidelines on borrow areas EIA Notification 2006(under Environmental Protection Act	-	During design and construction stage	Part of Project Costs	Contractor	IWAI/PMU /PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
land, land degradation, air pollution)		and Rules, 1986;)					
❖ 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 should be procured from licensed quarries. • It should be ensuring that selected quarries are having requisite environment clearance, and comply with Air Pollution Control and Noise level requirements as per the law. • Copy of Environmental Clearance letter and Consent to operate and should be obtained from the quarry owner and submitted to IWAI. • Material should be transported under covered trucks only. • No new quarry should be opened without due permissions. If new quarry is opened then it is require to obtain environment clearance from MoEFCC/SEIAA • Each Quarry should be visited prior to its selection to ensure its compliance with lease conditions, EC and consent conditions.	EIA Notification 2006(under Environmental Protection Act and Rules, 1986)	Quarry Site	During design and construction stage	Part of Project Costs	Contractor	IWAI/PMU /PMC
7. Protection of Flora and Fauna							

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
❖ Protection of impact on aquatic Fauna & Flora due to Increased sedimentation downstream of construction site	• To avoid the siltation in water 100m distance has been kept between existing and proposed lock gate. • No breeding ground is noticed around the project site. However, construction activity should be restricted during spawning & breeding period of fishes, i.e. June to August • To avoid the construction debris wash or blown into the water the construction area shall be surrounded by silt screens. • The screens should also be placed around storage areas, to prevent waste from blowing away and to prevent sediment run-off into the river. • All the material and debris shall be stored at least 20 meters away from the high water mark and construction equipment must not be cleaned or washed within 50 meters of the high water mark. • Run-off from site should pass through oil/grease traps and sedimentation tank before its reuse. All efforts shall be made for its reuse to avoid its discharge to river.	Wild Life (Protection) Act, 1972	Around Pilling Area	During design and construction stage	Part of project costs	PMU through DFO	IWAI/PMU /PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	• Construction activities shall be carried out rapidly. Culvert construction should not be carried out during breeding and spawning season means during rainy season. • Maintaining equipment in good condition to prevent leaks or spills of potentially hazardous materials like hydraulic fluid, diesel, gasoline and other petroleum products • Positioning water borne equipment in a manner that will minimize damage to fish habitat. • Turbidity traps/curtains should be provided or Geo-Textile synthetic sheet curtain shall be placed around the construction area to prevent movement of sediments and construction waste. • Excavation activities onshore shall not be undertaken during monsoon season so as to minimize sediment load of run-off. • All workers should be made aware of not throwing any waste in the river or any drain • No construction debris/ already accumulated solid waste at site or waste generated from labour camp						

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	should be thrown in river or any drain • Sewage generated from labour camp should not be directed into river but should be disposed off through septic tank/soak pit. • Engineering controls modify the equipment or the work area to make it quieter. Examples of engineering controls are: use of quieter equipment; retro-fitting equipment with damping materials, mufflers, or enclosures; erecting barriers; and maintenance. • Aquatic ecology monitoring shall be carried out prior start of construction and after completion of construction so as to assess the impact of construction activities on aquatic life. • Soil stabilization works in the bank must consider implications on changes in hydrological flow, current and behavior of the river. Such changes may create new problems such as change of river course, erosion of river embankment, change in erosion and inundation pattern of the bank						

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	etc. which will inturn impact the habitat of aquatic life • Sedimentation and siltation should be prevented to maintain productivity of aquatic ecosystem and availability of food such as aquatic fauna, vegetation to the avian fauna. • Green belt should be developed all around the project periphery. 1 ha of area is reserved as green area. App. 900 trees should be planted within the 1 ha of area to be provided at the site.						
❖ Impact on Avifauna including Migratory birds	• Hunting, poaching and harming any animal (especially avi -fauna) by any worker or project related person shall be strictly prohibited and monitored. • The designated imported bird area is located more than 4 km from the however it is recommended that, to conserve the local biodiversity (migratory birds of Farakka barrage area) the construction activities may stop for migratory periods of the birds if required. •	Wild Life (Protection) Act	Around Project Site	During design and construction stage	Part of project costs	PMU	IWAI/PMU /PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
❖ Impact on Terrestrial Flora & Fauna	• There are very few trees and some agricultural land scattered around the location, besides the green meadows around. Development of a green belt has been proposed all along the lock gate boundary. This would help in settlement of dust and keep atmospheric humidity under check. • As far as possible the existing trees present at site shall be retained under greenbelt • Permission should be obtained from forest department prior tree cutting if any. • Thick green belt should be developed around the periphery of the lock site. App. 900 trees will be planted at the site. Green belt should include native tree species like Pepal, Bargad, Arjun, Sheesham, Kaner, Neem etc. Green belt should be developed as per the CPCB guidelines proposed above climate section • 70 % survival rate for plantation shall be ensured. • Hunting, poaching and harming any animal (especially avi -fauna) by any	Wild Life Protection Act	In and Around Project Site	During design and construction stage	Part of project costs	Contractor	IWAI/PMU /PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	worker or project related person shall be strictly prohibited and monitored. • The designated imported bird area is located more than 4 km from the however it is recommended that, to conserve the local biodiversity (migratory birds of Farakka barrage area) the construction activities may stop for migratory periods of the birds if required. • Construction activities should be restricted to 6:00 Am-10:00 Pm especially noise generating activities • Illumination at the site shall be reduced during the night time (if no activity is going on) as it may disturb the nocturnal animals. • Noise generating activity shall not be undertaken during night time to minimize disturbance to animals. • Noise levels shall be maintained within the prescribed CPCBs limits to the extent possible during the day time. • No hazardous material or waste should be disposed off in the other land or nearby area as it may harm the animals, if consumed accidently						

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	• Regular water sprinkling shall be done in dust prone areas and haul roads. • Construction site shall be barricaded to reduce the dust and noise generation. • Speed limit will be for construction vehicle shall regulate to control noise and dust emission. • Regular maintenance of the dumper and construction machineries shall be done • No timber usage should be allowed for cooking or any other purpose at site during design, construction phase of the project. Clean fuel like LPG should be used						
8. Air Quality							
❖ Fugitive Dust Generation due to construction activities	• Barricading the site to prevent dust dispersion to nearby areas • Excavation and filling should be carried out in parallel. Excavation and filling should be carried out in phases • Excavated soil should be stored under covered conditions • Transport of loose and fine materials through covered vehicles.	Environmental Protection Act, 1986 and amendments thereof; The Air (Prevention and Control of Pollution) Act, 1981 and	Construction sites, Loading areas, storage areas,	During the Construction phase	Part of project Costs	Contractor	IWAI/PMU /PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	• Loading and unloading of construction materials in covered area. • Approach roads should be paved and widened. • Water spraying on earthworks, unpaved haulage roads, other dust prone areas and construction yard. • Make Provision of PPEs like face masks to workers. • Raw materials like cement, sand and construction debris should be stored under covered conditions • Wheel wash facility should be provided at exit points of the site • Monitoring of air quality should be carried out on monthly basis to check the level of pollutants and effectiveness of proposed EMP. • Development of green belt at the site efficient for arresting the particulate matter • Mixing Plant, crushers and batching plant should be located on downwind direction of the site fitted with adequate stack height to ensure enough dispersion of exit gases. with appropriate pollution control measures	amendments thereof					

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	• Low sulphur diesel should be used for operating DG sets and construction equipment.						
❖ Exhaust gas emissions from machinery and vehicular traffic.	• Regular maintenance should be carried out of machinery and equipment. • Diesel Generating (DG) sets should be fitted with stack of adequate height as per regulations (Height of stack = height of the building + 0.2 √ KVA.)	Environmental Protection Act, 1986 and amendments thereof; The Air (Prevention and Control of Pollution) Act, 1981 and amendments thereof	Construction camps and sites, batching plants, DG sets locations	During the Construction phase	Part of project Costs	Contractor	IWAI/PMU /PMC
❖ Emissions at access road: avoidance of traffic Jams	• Efforts should be made to move construction material early morning and late evening period. • Traffic regulators (Guard) should be posted in habitat area and at key junction areas to avoid congestion • No construction, material, equipment or vehicle should be stored or parked at any road or the non-project area • Transportation vehicle should strictly adhere to the designated routes and timings and should avoid the peak traffic hours	Environmental Protection Act, 1986 and amendments thereof; The Air (Prevention and Control of Pollution) Act, 1981 and amendments thereof	Existing roads	During the Construction phase	Part of project Costs	Contractor	IWAI/PMU /PMC
9. Noise and Vibration							

Environmental Issue/ Component	**Remedial Measure**	**Reference to laws and Contract Documents**	**Approximate Location**	**Time Frame**	**Indicative / Mitigation Cost**	**Institutional Responsibility**	
						Implementation	**Supervision**
❖ 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. • Barricading the construction site to minimize the noise level outside the site boundary • Timely maintenance and servicing of construction equipment and vehicles to reduce the noise generation due to friction and abrasion • Protection devices (ear plugs or ear muffs) will be provided to the workers operating in the vicinity of high noise generating machines. • Honking should be prohibited at the project site • All safety measures and Job rotations should be practiced for workers, working in high noise level areas. • No noise generating activity should be carried out between 6:00 AM to 10:00 PM. • Hearing test for the workers prior to deployment at site and high noise	Noise Pollution (Regulation and Control) Rules, 2000 and amendments thereof	Lock gate site and accesses road.	During the Construction stage	Part of project Costs	Contractor	IWAI/PMU /PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	areas followed by periodic testing every six months. • Monitoring of Noise levels should be carried out on monthly basis to check the level of pollutants and effectiveness of proposed EMP.						
10. Land-use and Landscape							
❖ Land use Change and Loss of productive/top soil	• Efforts should be made to improve the Aesthetic of the area. No construction waste or other wastes should be dumped at unidentified areas. • Caution board in local language should be placed at different locations to prevent dumping of Municipal solid waste and other waste all around the project site areas which is happening substantially at present. • About 15 cm of top soil layer should be stripped prior to excavation and stored separately in covered condition and should be used for landscaping of the lock gate site. • The remaining excavated soil should be used for filling of site and road realignment. Excess earth, if any shall be disposed off at the locations designated by the authorities or to	Design requirement	Around project site area and borrow area	During construction Stage	For five caution boards	Contractor	IWAI/PMU /PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	the debris disposal site identified for the project • Land earmarked for dumping of construction waste, setting up of construction camps, plant sites etc should be free from any social and R&R issue and away from settlements.						
❖ Soil erosion due to construction activities, earthwork	• Excavation and filling operations should be carried out in parallel so as to minimize the soil erosion. Unusable debris material should be suitably disposed off at pre designated safe disposal sites, but with prior approval of the concerned authority. • Provision of cross drainage structure should be made in the access road if required to maintain the natural drainage pattern and prevent soil erosion • Provision of side drain should be made in realigned road if required to prevent soil erosion • Provision of geo-textiles matting, stone pitching, retaining wall, apron etc should be made to prevent the		Access road and river bank	During construction Stage	Part of project costs	Contractor	IWAI/PMU /PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	erosion of bank and scouring of bed during operation phase • Bio-turfing of embankments should be made enhance the slop stabilization.						
❖ Soil erosion at earth stockpiles	• The earth stockpiles to be provided with gentle slopes to prevent soil erosion. • Provision of geo-textiles matting, stone pitching, retaining wall, apron etc should be made to prevent the erosion of bank and scouring of bed during operation phase • Soil compaction at the site should be undertaken by regulated water sprinkling to minimize any surface runoff or soil erosion		At earth stockpiles	During construction Stage	Part of project costs	Contractor	IWAI/PMU /PMC
❖ 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 should 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-fueling areas. • Oil and grease spill and oil soaked materials are to be collected and stored in labelled containers (Labelled: WASTE OIL; and		lock gate site	During Design & Construction stage.	Part of project costs	Contractor	IWAI/PMU /PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	hazardous sign be displayed) and sold off to SPCB/ MoEF authorized vendors. • Movement of construction vehicles, machinery and equipment should be restricted to the designated haulage route.						
11. Water Resources							
❖ Depletion of Groundwater resources due to unregulated abstraction for construction purpose	• Water required for construction should be sourced from rivers with due permission from authorities. • Water required for domestic uses should be sourced from supply water. • Efforts to restrict water intensive activities during summer period (April, May, June) • No dumping of waste/wastewater in the ground. waste or wastewater should not be stored in unlined ponds			During Construction stage	Part of project costs	Contractor,	IWAI/PMU /PMC
❖ Increase in water Siltation levels due to construction of lock due to disposal of	• Restoration of changes in the stream, if any, made during construction to its original level. • Mobile toilets with anaerobic digestion facility should be fixed at construction site. No domestic waste should be discharged to river.		Lock gate site	During Construction stage	Part of project costs	Contractor	IWAI/PMU /PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
domestic waste	• Excavation activity should not be carried out during monsoon season • Garland drains should be provided around excavated area so as to prevent entry of run-off to the excavated pits • Excavated areas should be covered to the extent possible to prevent entry of rainfall run-off in case of rains • The storm water drain should be connected to a collection cum sedimentation pond to collect the surface run of the construction area. The collected rain water should be used for dust suppression purposes at construction material handling area. Storm water drains should be provided for the parking areas also and these drains should be provided with oil & grease trap • No waste should be disposed off in river and ground while filling and excavating. • Washing of vehicle and equipment should not be carried out at river or any water body. Washing area should be provided with the storm						

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	water drains fitted with oil & grease trap. • Monitoring of surface water quality should be carried out on monthly basis to check the level of pollutants and effectiveness of proposed EMP • Storage of debris and raw material should be carried out in paved and covered areas. This will minimize interface of run-off with raw material and debris. • Water use should be minimized by using RMC, practicing curing by water sprinkling, maintaining flow of sprinklers, covering the water storage tanks to minimize water evaporation, creating awareness for water conservation and regular inspections at site to monitor the leakages in water storage area • In case RMC is not used then concrete transit mixer should be washed and cleaned daily. Wash from these mixers should be collected in block work tanks which will allow settling of concrete, removal of aggregates and allowing the waste to wastewater drain. This collected waste concrete can be						

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	dried and used for various purpose at site. • Wastewater generated from the washing/cleaning area after passing through oil & grease trap & curing area should be re-used for water sprinkling and wheel washing • Turbidity traps/curtains should be provide or Geo-Textile synthetic sheet curtain should be placed around pilling and construction area to prevent movement of sediments and construction waste. • Septic tank/soak pit should be provided at site for disposal of sewage from the toilets at site and from the labour camps. Adequate toilets & bathrooms should be provided to prevent open defecation. • Fuel should be stored in leak proof containers and containers should be placed on paved surfaces. • Proper collection, management and disposal of construction and municipal waste from site to prevent mixing of the waste in run-off and entering the water bodies • Natural Drainage pattern of area around should be maintained.						

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
12. Accident and Safety Risks							
❖ Accident risk from construction activities and health and safety of workers	• Contractors to adopt and maintain safe working practices. • Usage of fluorescent safety and cautionary signage, in local language at the construction sites • Training should 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 should be provided to workers. • Periodic medical checkup should be carried of the workers. • Training should be given to workers to handle the heavy equipment so as to prevent accidents • Training should be given to workers to handle emergency situation like fire, earth quake and flood	Central Motor and Vehicle Act 1988 EP Act 1986 Noise Rules 2002	Construction sites	Construction period	Part of project costs	Contractor	IWAI/PMU /PMC

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	• Rest area should be provided at the site where labour can rest after lunch and should not lie on site anywhere • Adequate illumination should be maintained in the working area, in labour camps and plant site. • Working hours of labour should not exceed than standard norms as per state factory law • Construction labour camps and site should be properly cleaned and hygiene should be maintained • Proper sanitation facility like toilet and bathing facility should be provided at labour camps. Wastewater generated from these facilities should be disposed off through septic tanks and soak pit • Safety officers should be appointed at site so as to ensure all safety measures are taken at the site • Activity like smoking and consuming liquor should be prohibited at the site • Awareness on AIDS should be spread among the workers • Regular inspection for hygiene and safety in labour camps should be done						

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	• Speed limit of vehicles should be restricted at site to prevent any accidents. • Noise level in the work zone should be maintained and followed as per OSHAS norm • Employment should be provided preferable to local & affected people • Dustbins should be provided at labour camps for collection of waste and waste should be regularly disposed off through the concerned agency • Arrangement of fire-fighting should be made at site and workers should be trained to use the system in case of fire						
13. Shifting of Common Property Resources and Pressure on Existing Resources in Study Area							
Shifting of community properties and utilities	• Any CPR, if removed should be relocated at the earliest with consent of the villagers and the Gram Panchayat		Project Area	Pre-Construction	Part of Project Costs	Contractor	IWAI/PMU /PMC
Pressure on Existing resources	• Non-productive lands, barren lands, raised lands; wastelands should be used for setting up labour camps, plant sites and debris disposal site. The above sites will be located more than 500 m away from the settlement and other sensitive location.						

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	• Land should be used for establishment of construction camps, debris disposal site and plant site only after obtaining consent from land owner. • Necessary permits should be obtained from concerned authorities in case any quarry site, batching plant, hot mix plant, WMM plant etc. is set up. • Management, rehabilitation and closure of these sites should be as per the Management plans proposed for these sites. Records for starting, maintaining and closure should be maintained and should be approved by site engineers • Top soil should be stripped off from these sites prior to usage and should be sprayed back at the time closure. Top soil should be stored in covered condition • Entrance to any road/structure should not be blocked for construction of lock gate. • Site should be barricaded and should have entry guarded by security guard. Register should be maintained for entry of outsiders. No						

Environmental Issue/ Component	Remedial Measure	Reference to laws and Contract Documents	Approximate Location	Time Frame	Indicative / Mitigation Cost	Institutional Responsibility	
						Implementation	Supervision
	unauthorized person should be allowed to enter the site especially village children • A board should be displayed at entrance of site displaying name of project, area and hazards associated with the site on entrance and activities prohibited within and near site area in local language • All proposed environmental pollution measures should be taken during construction of phase of lock gate to minimize the harm to existing environmental quality of the area, which is being enjoyed by the residents of that area • Maintenance and repair of the road should be carried out both before and end of construction by contractor. • Sprinkling of water should be carried out in road also, so as to minimize dust generation due to movement of construction vehicles						

Table 1.2 : Environment Management Plan of Farakka Lock 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. Air Quality								
1.1 Air pollution due to Barrage /vessel movement	• Use of low sulphur fuel by barges. • Regular maintenance of barges. • Electronic charting for proper scheduling of the inland traffic • Diesel Generating (DG) sets should be fitted with stack of adequate height as per regulations (Height of stack = height of the building + 0.2 √ KVA.) • Maintenance of green belt and maintaining survival rate of trees to minimum 70%	Environmental Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981	project area	MI: Ambient air quality (PM_{10}, CO,SO_2 NO_x)	• As per CPCB requirements	Included in Operation/ Maintenance cost	Contractor	IWAI/PMU/PMC L
2. Noise Level								
2.1 Increased noise due to barge movement and vehicular movement	• Earplugs should be provided to workers involved in unloading operations • Provision of thick green belt along the boundary	Noise Pollution (Regulation and Control) Rules,	Realigned Road & Lock Site	MI: Noise levels at the site and access road PT: No accidents	Visual inspection Check accident	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
	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 employing them and thereafter shall be done after every six months • Job rotations should be practised for people, working in high noise level areas • No noise generating activity shall be carried out between 6:00 AM to 10:00 PM	2000		due to vegetation growth	records	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
	• Noise generation activities shall also be restricted during migratory period of the birds, i.e. Winter season as it may impact their activities • 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. Water Quality								
3.1 Siltation	• Regular checks should be made for soil erosion and turfing conditions of channel/ river bank structures for its effective maintenance.	Project requirement	Near banks of the navigation channel	MI: TSS monitoring of water	Site observation	Included in Operation/ Maintenance cost	Contractor	IWAI/PMU/PMC L

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 Waste Water treatment and conservation	• Sewage generated from site should disposed off in soak pit and septic tank. • Storm water drainage system should be provided with jute filtration at the site Water conservation fixtures should be installed in toilets. Some of the water conservation fixtures which can be installed are dual flushing cisterns, sensor taps, low water urinals etc. • No wastewater should be received from vessels and vessels should not be allowed to discharge their wastewater and solid waste in river. • No waste/wastewater should be discharged in river or dumped into the ground	Project requirement	Project area	MI: Proper treatment				

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
	• Fuel should be stored in leak proof containers and containers should be placed on paved surfaces • Monitoring of surface water quality should be carried out on six monthly basis to check the level of pollutants and effectiveness of proposed EMP							
4. Land and Soil								
4.1 Soil erosion due to barge movement and soil contamination due to waste spillage	• Periodic checking to be carried to assess the effectiveness of the stabilization measures viz. turfing, stone pitching, river training structures etc. • Necessary measures to be followed wherever there are failures. • Two separate waste bins should be placed to collect the daily waste as organic and inorganic. All plastic	Project requirement	Along banks and embankment slopes and other probable soil erosion areas.	MI: Existence of soil erosion sites Number of soil erosion sites PT: Minimal occurrenc	On site observation	Included in Operation/ Maintenance cost	Contractor	IWAI/PMU/PMC L

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
	materials would be sold to secondary users for recycling. Biodegradable waste could be compost and later use as fertilizer. • Adequate numbers of sanitary latrines with septic tank and soak pit will be installed for the workers during the operational phase.			es of soil erosion				
5. Flora & Fauna								
5.1 Impact on terrestrial and aquatic flora & fauna due to water pollution and barge movement and bank erosion	• Green belt as trees, shrubs, and grasses to be properly maintained • No wastewater or waste shall be disposed off in river from project site or from vessel into the water. Penalty shall be imposed on the vessels reported of disposing waste/wastewater in the river • Sewage generated from the site shall be disposed in soak pit and septic tank.	Forest Conservation Act 1980, Wild Life Protection Act, 1972	Project tree plantation sites. Dolphin movement locations	MI: Tree/plants survival rate PT: Minimum rate of 70% tree survival and observations	Records and field observations. Regular monitoring	Operation/ Maintenance Cost	Contractor/ Forest Department	IWAI/PMU/PMC L

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
	• Precautionary measures viz., use of better/ fool proof handling equipments, transportation of coal in closed barges to be strictly followed to ensure zero spillage of coal particles during loading, transport and unloading. In addition, strict measures to be implemented to prevent spillage/leakage of oil and grease at filling, handling and servicing points of vessels in order to protect environment, and biota. Care should be taken so that the sewages and garbage generated are disposed at designated sites only after necessary treatment. • During night operations, the barges should use powerful search lights and horns so as to warn							

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
	the fishers of the incoming barges well in advance at least from 500 m away. • Standard Operating Procedures (SOPs) to prevent spillage of oil/ fuel/ grease will be followed. • Reducing speed of barges in the curved and narrow stretches from its normal speed of 7-8 nautical miles/h to 5-6 nautical miles/h is recommended for reducing the wave action and thereby minimizing possibilities of bank erosion. • To prevent bank erosion the vessels should navigate only through the designated navigation. • In case of damage of fishing nets, fishing crafts and other gears of fishers, arising due to							

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 operation, appropriate and quick compensations may be given to the aggrieved fishers • Preparation and publishing barge movement schedule, pre-signaling of movement, fixed timing, generation of awareness on barge movement among public, specifically the fishers and ferry operators may be made. • Instruction should be given to all vessels and all employee and staff that no aquatic fauna shall be harmed due to any reason • Quick cleanup operations should be carried out in case of accidents. Vessel owner should be responsible for paying the clean up expenses in case of the							

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
	accidents and pollution of river water quality							
6. Safety								
6.1 Accident Risk due to uncontrolled growth of vegetation	• Regular maintenance of plantation along the internal roads • No invasive plantation to be carried out near the road	Project requirement	Access Road	MI: Presence and extent of vegetation growth on either side of road. Number of accidents. PT: No accidents due to vegetation growth	Visual inspection Check accident records	Included in operation/Maintenance cost	IWAI	IWAI
6.2.Transport of Dangerous Goods	• Existence of spill prevention and control and emergency responsive system • Emergency plan for vehicles carrying hazardous material	-	Throughout the project stretch	MI: Status of emergency system – whether operational	Review of spill prevention and emergency response	Included in operation/Maintenance	Contractor	IWAI/PMU/PMC L

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
				or not PT: Fully functional emergency system	plan Spill accident records	cost.		
6.3 Accidents Risks Due to Movement of Vessels and other hazards associated with site	• 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. In case of accidents, ship owner should be responsible for cleanup operations • Provision of hooters and sensors in ships to prevent the collisions • Safety norms should be followed for all	-	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
	operational phase activities at site • Safety training should be given to the site staff for managing the floods, earthquake, fire, ship accidents like situation. Emergency collection area should be designated at the site which is safe. All workers should be directed to collect at this area in case of emergency. • Firefighting facility should be provided at site and trained personnel should be available at site who can operate the fire extinguishers and other fire-fighting equipment.							
6.4 Welfare of Society	• Employment should preferably be given to local people. Women should be given equal opportunity for work.	-	Throughout the project	MI: CSR Activities PT: CSR Action Plan	Review of CSR Activities through NGO	Included in operation/Maintena	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
	• Development activities should be carried out in the village and nearby areas for development of area		stretch		accident records	nce cost.		

Table 1.3 : Environment Monitoring Plan of Faraka Lock for Design, Construction & Operation Phase

S. No.	Aspect	Parameters to be monitored	No of sampling locations & frequency	Standard methods for sampling and analysis	Role & Responsibility	
					Implementation	Supervision
Design & Construction Period						
1.	Air Quality (Ambient & Stack)	PM_{10}, $PM_{2.5}$, SO_2, NO_2, HC and CO	Three Locations including project site, labour camp and nearest habitation-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_2, CO analyzer /portable CO meter for CO portable HC meter or tubes for HC; TO-14A, TO-15, USEPA method for sampling	Contractor	IWAI & PMC

				and analysis of VOCs in ambient air		
2.	Surface Water Quality	Physical, chemical and biological	River Ganga-upstream & downstream-Once a month	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 village Once a month	Noise meter	Contractor	IWAI & PMC
5.	Soil Quality, Erosion & Siltation	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.	Greenbelt development	Plantation survival rate	Lock gate premises	Survey, counting, recording & reporting	Contractor	IWAI & PMC
7.	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
8.	Aquatic ecology	Phytoplankton, Zooplankton	River Ganga Six monthly	Species diversity index.	Contractor	IWAI & PMC
9.	Integrity of embankment	---	Upstream & downstream of lock gate 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	Two locations- project site, and nearest habitation 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_2, CO analyzer /portable CO meter for CO portable HC meter or tubes for HC; TO-14A, TO-15, USEPA method for sampling and analysis of VOCs in ambient air	NABL Lab to be contracted by IWAI	IWAI
2.	Surface Water Quality	Physical, chemical and biological	River Ganga- Once in quarter (Upstream & Downstream)	Grab sampling and analysis by using standard methods	NABL 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 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, and nearest habitation Once a quarter	Noise meter	NABL Lab to be contracted by IWAI	IWAI
5.	Greenbelt	Plantation survival rate	Site premises	Survey, counting, recording & reporting	IWAI	IWAI
6.	Soil Quality, Erosion & Siltation	---	Upstream & downstream of project site near river channel Bank-Monthly	Physio chemical parameters of soil Survey & observation; Extent and degree of erosion; Structures for controlling soil erosion	IWAI	IWAI

7.	Aquatic ecology	Phytoplankton, Zooplankton	River Ganga-Six monthly	Species diversity index	IWAI	IWAI
8.	Integrity of embankment	---	Upstream & downstream of lock gate site-Once a month	Survey & observation; Extent and degree of erosion; Structures for controlling soil erosion	IWAI	IWAI

Annexure 1: Tree Plantation and Management Plan

1.0 Introduction

Green belt acts as bio filter for the air pollutants and play a major role in safeguarding the environment and controlling the increasing level of air and noise pollution. It can serve as buffer and shock absorber against transient and accidental release of pollutants from industrial activity.

The green belt has been recommended as one of the major components of the EMP which will further enhance the environmental quality by:

1. Mitigation of air pollution
2. Attenuation of noise level
3. Maintaining the bio diversity of the area and improve aesthetics.

1.1 Size of Green belt

Dense greenbelt should be developed all along the boundary of the lock gate premises. The length and width of the greenbelt will be 1000 m x 10 m. About 10000 m^2 has been kept for green belt development and 900 trees along with herbs and shrub will be planted. 3x3 m spacing will be kept between trees. 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.

1.2 Selection of Tree Species

The Project construction involve movement of vehicle for transportation of material Thus emissions like particulate matter, SO2, NOx & CO shall be generated at site. Plants possess a large surface area and their leaves exhibit an efficient pollutant trapping mechanism. The effectiveness of plants to control pollution depends upon the physiological, morphological traits such as leaf epidermis, size, leaf orientation, internal enzyme system, etc. Systematic screening of plants for their ability to tolerate pollutant need be undertaken. For pollution abatement purposes tree species would be fast growing native species, wind firm, unpalatable to animals, hardy and dust and pollutants tolerant/resistant.

1.3 Time of Plantation

Plantation would be done two weeks after the rain starts. It is advised to avoid planting during the dry season, as this will require watering. It is advantageous to plant trees on cloudy days.

1.4 Recommended Plant species

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

S. No.	Plant Species	Common Name	Habit
1.	Anthocephalus cadamba	Kadam	Tree

2.	Ficus bengalensis	Badh	Tree
3.	Magnifera indica	Aam	Tree
4.	Tectona grandis	Teak	Tree
5.	Ficus religiosa	Peepal	Tree
6.	Hibiscus rosa sinensi	Hibiscus	Shrub
7.	Litchi chenensis	Litchi	Tree
8.	Delbergia sisoo	shisham	Tree
9.	Bougainvillea glavra	Bougainvillea	Shrub
10.	Narium indicum	Kaner	Shrub
11.	Azidirachta india	Neem	Tree
12.	Delonix regia	Gulmohar	Tree
13.	Albizia lebbeck	Siris	Tree
14.	Cassia fistula	Golden shower	Tree
15.	Pongamia pinnata	Indian beech	Tree
16.	Grasses and hages	--	Herbs

1.5 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.

1.6 After Care & Monitoring

The growing plants are cared at least for the first two years under favorable 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.

1.7 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.

Annexure 2: Guidelines for On Site and Off Site Emergency Management

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
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 3: Guidelines for Debris and Solid Waste Management

1.0 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.

1.1 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 filling 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 or for mines rehabilitation located in the nearby areas.

1.2 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 off 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 off at disposal site but if toxic & contains heavy metals, then it should be disposed off to TSDF site.

1.3 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 off at approved debris site in covered vehicles.

1.4 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 off 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 off in a secured manner. Thus a site should be identified for disposal of the rejected waste.

1.5 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.

1.6 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 off 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 off through covered vehicles only
- No contaminated/hazardous/e-waste shall be disposed off at the debris disposal site

1.7 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 off daily and capacity of disposal site.

1.8 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

1.9 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 4: Selection and Management of Construction/Labour Campsite

1.0 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 for setting up such facilities.

2.0 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
- 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
- Creche Facility & Play School
- Fire-fighting Facility
- Emergency Response Area

2.1 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

2.2 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 water shall be carried out on monthly basis.

2.3 Clean Kitchen Area

Provision of clean kitchen area for cooking and storage of etables 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.

2.4 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.

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.

2.5 Waste Management Facilities

Waste generated should be segregated at the site by providing the different color 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.

2.6 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.

2.7 Adequate Illumination & Ventilation

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

2.8 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.

2.9 Health care Facilities:

First aid box, first aid room and personnel trained in first aid 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. Workers shall be made aware about the causes, symptoms and prevention from HIV/AIDS through posters and awareness programs

2.10 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.

2.11 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.

2.12 Emergency Collection 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.

3.0 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.
- 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

4.0 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.

5.0 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.

6.0 Auditing & Inspection

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

7.0 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 off 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.