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GOVERNMENT OF KARNATAKA

Karnataka Urban Water Supply Modernization Project (KUWSMP)

DRAFT FINAL ENVIRONMENTAL CODE OF PRACTICES

KUIDFC

Karnataka Urban Infrastructure Development Finance Corporation (KUIDFC)

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1 Introduction

The Environmental Codes of Practice (ECoP), a part of the Environment and Social Management Plan (ESMP) is prepared for the **Karnataka Urban Water Supply Modernization Project**, covering three participating cities, namely Belagavi, Kalburgi and Hubballi-Dharwad. Experiences elsewhere in the world indicate that, through proper planning, design and operation, environmental impacts can be reduced to its permissible levels that optimize the overall benefits of the projects through best construction and operation practices. However, there are no set practices or guidelines in India to integrate environmental considerations of urban infrastructure projects into the project development process except township, area development and Water Supply manuals.

The main objective of this Environmental Code of Practice is to integrate social and environmental aspects while planning, study, survey, design, tendering, contract documentation, project execution and supervision, operation, maintenance, and rehabilitation of water supply project which would guide KUIDFC/ULBs/Contractor in implementing the environmental management measures recommended in SESA-ESMP of proposed project. The code also provides guidance to the project planners in assessing the social and environmental impacts of the project. Therefore, the ECP has to be considered as a "living document" which, from time to time, may need updation/ revision to retain “requirements” that are relevant to the environmental and a social conditions in the project cities.

The following ECoP is prepared for the project:-

- ECoP 1.0: Project Planning and Design
- ECoP 2.0: Site Preparation
- ECoP 3.0: Construction Camp Management
- ECoP 4.0: Alternate Materials for Construction
- ECoP 5.0: Water for Construction
- ECoP 6.0: Waste Management
- ECoP 7.0: Water Bodies
- ECoP 8.0: Water Quality Management
- ECoP 9.0: Construction Plants and Equipment Management
- ECoP 10.0: Public and Worker's Health & Safety
- ECoP 11.0: Road, Transport and Road Traffic Management
- ECoP 12.0: Cultural Properties
- ECoP 12.0: Environmental Monitoring and Audit
- ECoP 13.0: Consultation Framework
- ECoP 14.0: Soil Management
- ECoP 15.0: Borrow Areas Development and Operation

2 ECoP 1.0: Planning and Design

This code of practice details the factors to be considered during project preparation to avoid/address environmental concerns through modifications in project design and incorporation of mitigation measures. Guidelines specified in the CPHEEO Water Supply Manual for project preparation are to be followed in conjunction with the measures suggested as part of this ECoP.

All requirements of Central Public Health and Environmental Engineering Organisation (CPHEEO)" **Manual on Water Supply and Treatment** and in selection of alignment should be met with in selection of alignment and design. In addition, adequate consultations with the communities to identify the concerns and preferences need to be taken up during selection of pipe line route.

The alignment should be…

- Easy and safe to construct and maintain
- Economical
- Laid on firm ground and
- Having least adverse environmental impacts.

The planning, study and surveying stage of the project has the **major impact** with regard to environment and economy of a water project. It is imperative to assign these tasks to highly experienced engineers only. Geologically weak and ecologically sensitive areas have to be avoided if ever possible and the alignment of water supply pipe line must be optimally integrated into the terrain.

The responsibility for planning, studying and surveying lie with the Operator and to be approved by KUIDFC & ULB in consultation with Independent Engineering consultant. The work sequence for planning, studying and surveying follows as below:

Planning

- Topographical and infrastructure survey covering the entire Service Area and existing infrastructure from the source to the Customer including those areas within the Service Area that are not provided with water supply should be carried out.
- Geological assessment of construction area
- Input of all available data (e.g. social, cultural, environmental and geological) into topographical map
- Study based on topographical or Contour map

Prepare an Inventory of the following

- Trees
- Forests, if any
- Rivers/Streams/Water crossings if any
- Cultural/Religious properties
- Schools
- Hospitals/Health Centers
- Common Property Resources/Community Facilities
- Seasonal markets or cultural congregations
- Location for ducts for threading agricultural/utility pipes
- Utilities (Electrical, Water Supply Lines, Stand Posts, Cables)

- A service improvement plan and a Geographical Information System (GIS) system should be developed based on the topographical and infrastructure survey.
- Customer survey should be carried out in water supply areas and non-water supply areas
- Assessment of water resources should be conducted (either by the department itself or the external agency) before planning of project
- Ground reconnaissance for all water supply line alignment, reservoirs and WTP options
- proposal of best alignment and site location options

A r comprehensive assessment should be conducted for both existing and proposed water supply infrastructure by the Operator which clearly identifies the following.

- Need for the project;
- Quantity of water to be supplied or augmented to improve the present situation, including the population to be served;
- Quantity and quality of water available (surface / ground water) for each source;
- Current water usage patterns (domestic , industrial , irrigation and others);
- Broad cost estimates for each of the alternative source / design concept along with economic and financial analysis of the same

The ULB/SPV can prepare Information-Education-Communication material and use the services of NGOs in disseminating the information among the consumers and create awareness among the public. Quite often there is an acute dearth of information on material inventories, tools, spares, staffing pattern, costs etc. Hence setting up a Management Information System is one of the most important tasks in the institutional development which could lead to sustainable O&M.

MIS is used to analyse and evaluate the performance of system. The MIS could also be used in assigning responsibilities and in distribution of human, material and financial resources to ensure sustainable O&M.

Recommended Practices for Alignment Finalisation...

- Utilise existing water pipe line tracts as far as possible
- Follow natural topography
- Conform alignment to within property boundaries within community areas
- Adopt geometrics that do not compromise on safety requirements
- Avoid crossing utilities like telephone and electric cables, existing sewer and gas pipes,
- Avoid alignments affecting vegetation and felling of trees
- Avoid alignments close to streams
- Avoid encroachment of water bodies and
- Avoid passing through natural habitats as designated forests, sanctuaries, national parks and wetlands

Design Considerations

All the design should confirm to the specifications of CPHEEO "**Manual on Water Supply and Treatment, 1999" or its latest amendments.** Additional measures suggested for minimisation of environmental impacts, safety of worker's and for enhancement of community benefits are indicated in this ECoP. All data collected during the previous planning stages must be made available to the design engineer. In order to get a realistic picture of the prevailing site conditions the design engineer must visit the vulnerable areas before he starts with the design to be able to produce a realistic and sound design. The responsibility for the design lies with the Operator. The work sequence for design follows as below:

- Population and design period
- Water demand, per capita water supply and other water needs
- Plant Siting
- Water Conservation
- Mechanization
- Service Buildings

- The elevation of the service reservoir should be such as to maintain the minimum residual pressure in the distribution system consistent with its cost effectiveness. The hydraulic gradient in the pipe should normally be between 1 and 4 per thousand at peak flow. A suitable combination of pipe sizes and staging height has to be determined for optimization of the system. The staging height of service reservoirs should be optimal to ensure continuous pressured supply.

- **Horizontal Separation:** A water main should be laid such that there is atleast 3 m separation, horizontly from any existing or proposed drain or sewer line. If local conditions prevent this lateral separation, a water main may be laid closer to a storm or sanitary sewer, provided that the main is laid in a separate trench or on an undisturbed earth located on one side of the sewer at such an elevation that the between of the water main is at least (0.5 m above the top of the sewer).

- **Vertical Separation:** In situations where water main have to cross house sewer, storm drain or sanitary sewer, it should be laid at such an elevation that the bottom of the water main is 0.5 m above the top of the drain or sewer with the joints as remote from the sewer as possible. This vertical separation should be maintained for a distance of 3 m on both sides measured normal to the sewer or drain it crosses.

- **Unusual Conditions:** Where conditions prevent minimum vertical separation set forth above from being maintained or when it is necessary for the water main to pass under sewer or dain, the water main should be laid with flanged cast iron with rubber gasket joints for a length on either side of the crossing to satisfy the lateral separation of 3 m. A vertical separation of 0.3m between the bottom of the water main and top of the sewer should be maintained with adequate support for the larger sized sewer lines to prevent them from settling on or breaking the main.

- Where a water main has already been laid and where a new sewer is to laid, the above aspects may also be taken into consideration and the water main may be realigned to the extent necessary, when it is not possible to lay the sewer consistent with the above recommendations. Flow meters are installed at start and end points of transmission channels/pipes for monitoring the flows and an operation schedule should be prepared for record of water distribution.

- The water supply systems should be designed to supply water free from pathogenic organisms and should be clear, potable and free from undesirable taste and odour. The systems should be designed to meet the standards. The physical and Chemical drinking water quality should be as per the Indian National Drinking Water Standards (IS: 10500, 2012)

Community Concerns*:* Community concerns, expressed during consultations are to be addressed to the extent possible in the design and laying of pipelines. The concerns need to be documented (format in annexure). In case any of the measures are not incorporated, the same needs to be intimated to the community with adequate explanation after design finalization.

Work Signage: Adequate informatory, cautionary and warning signs should be provided to ensure traffic safety, especially in the event of adoption of lower standards. The signboards should be placed such that they do not block the line of sight.

Environmental Considerations

An inventory of all environmental features along the proposed pipe line route is to be prepared and marked on a revenue or city map or a strip chart. This would be conducted by the Operator by survey. Consultations with the local communities are to be conducted during these survey to obtain their suggestions and incorporate their concerns to address the potential environmental impacts. Suggestions of the community during the survey are to be incorporated, to the extent possible, while finalising the route. The methodology for conduct of transect shall be as per **ECoP-13.0, "Consultations for Environmental Aspects**".

Key environmental concerns to be mitigated...

- Land, including loss of productive topsoil
- Drainage
- Land use and Livelihood
- Vegetation, cutting of trees
- Water bodies and water quality
- Wetlands
- Structures and Common property resources
- Disposal of excess material from excavation

Environmental considerations for various activities and sub-activities in the project are presented in the Table 4. Measures for the same are to be incorporated in the project preparation stage to offset environmental impacts in the subsequent stages (Table 3). The measures shall be in conformance with the ECoP referred against the activities.

Project Activities prioritized as per the core network shall be subjected to screening as per the screening checklist. The water supply network so screened as per the checklist shall be subjected to greater analysis in the DPR for the issue/s due to which it is screened.
Environmental concerns of the community shall be incorporated to the extent possible in the project preparation and in subsequent stages of the project. This is achieved through various consultation tools by PIU or Contractor (Table 1).

Table 1: Consultations to be conducted in various stages of the project

S. No.	Stage/ Activities	Responsible Agencies	Stakeholders	Tools & Techniques	Desired Outputs	Reference
1	**Project Prioritization**					
1.1	Dissemination of feasibility report	PIU	Community	Display of feasibility report along with	Increasing awareness of community about	Social/ Resettlement Framework

S. No.	Stage/ Activities	Responsible Agencies	Stakeholders	Tools & Techniques	Desired Outputs	Reference
				proposed capex works	proposed works	(if applicable)
2	**Start Up Period**					
2.1	Dissemination of project information	PIU	Community	Distribution of Project Information	Increasing awareness of community about roles and responsibilities	Social/ Resettlement Framework (if applicable)
2.2	Finalization of Pipe line route	Operator	Community	Survey	Inventory of environmental features, identification of sites for identification of PAPs	ECoP-1
2.2	Formal Consultations with PAPs (if any)	PIU	Community	Focus group discussions, public meetings	Disseminate information on environmental concerns incorporated/ not incorporated into design	Social/ Resettlement Framework (if applicable)
2.3	Formal Consultation with Irrigation Department, if required	Operator	Operator	Focus discussions	Information about the water availability	ECoP-1
3.	**Transition Period**					
3.1	Consultations for temporary use of land	Contractor and Operator	Community / land owner	Individual consultations	Seeking consent on temporary use of land and setting terms of use	ECoP-3.0 ECoP-6.0 ECoP-9.0 ECoP-11.0
3.2	Consultations for extraction of water	Contractor and Operator	Community / land owner	Individual consultations	Seeking consent on extraction of water	ECoP-5.0

Towards implementation of the environmental provisions by the contractor as per the ECoPs, he shall nominate one of his senior personnel to ensure that the construction practices comply with the ECoPs.

Compliance to Legal Requirements

The clearance requirements as per the various legislations in force towards the conservation of the environment during the various project stages, as applicable to the project are presented in **Table 2**.

Table 2: Key Regulatory Requirements

Project Activity	Compliances/ Clearances	Towns			Responsible Agency		
		Belagavi	Kalburgi	Hubbli-Dharwad	Primary	Monitoring	Overall
Use of Diesel Generator sets at any stage during project cycle.	Consent from KSPCB under Air Act	Yes	Yes	Yes	Contractor	Operator	ULB/SPV/ PIU
Replacement of Old Pipe line, laying new pipe line, construction of WTP and Reservoirs	Approvals from State Forest Department in case of land appropriation of forest land (if any other than the identified proposed sites.)	No (None as per the feasibility report)	No (None as per the feasibility report)	No (None as per the feasibility report)	Contractor	Operator	ULB/SPV/PIU
	Permissions from Railways for crossing railway lines	Yes Central Railway at locations Zone 1,7,8 and 10 (Ward no : 13,8,19,27)	Yes Central Railway at locations Zone 1 and 2 (Ward no: 48, 53, 55)	Yes Central Railway at locations Zone H 26 (Railway Area Bulk)	PIU/SPV	ULB	ULB
	Permissions from PWD/NHAI for road cutting.	Yes NH 4, and 4A and Asian Highway 47(Ward no: 13, 27, 44, 19, 03,49,27)	Yes NH 10, 51, 149 and 218(Ward no :22,19,17, 48,5,12,28 ,29,46,48, 54,55)	Yes NH 73, 4, 63 and 218 and Asian Highway 47(Ward no: 44,41,21, 18, 40, 17,21,36)	PIU/SPV	ULB	PIU
	Permissions from Irrigation Department for drawing water	Not applicable as per the feasibility report	Not applicable as per the feasibility report	Not applicable as per the feasibility report	PIU		PIU
	Permission from Central Ground Water Board for	Yes	Yes	Yes	PIU/SPV		ULB

Project Activity	Compliances/ Clearances	Towns			Responsible Agency		
		Belagavi	Kalburgi	Hubbli-Dharwad	Primary	Monitoring	Overall
	withdrawing Ground Water (if required at any stage of project)					ULB	
	Permission from Traffic Police Commissioner office for traffic management.	Yes	Yes	Yes	PIU/SPV	ULB	ULB
Storage and Handling of Chlorine for Water Treatment	Permission from KSPCB under MS&H Rules, 1989 for Storage and Handling of Chlorine	Yes	Yes	Yes	Operator	SPV/PIU	ULB

The bid document shall include the various applicable clearances pertaining to environmental management and shall contain the necessary procedures for compliance of the same. The site for construction shall be handed over to the contractor, free from encumbrances and encroachments. Forest clearances, if required shall be obtained prior to start of the project and utilities shall be relocated before handing over site.

Integrating Environmental Provisions in Bid Documents

All work items concerning environmental issues must be included in the Tender Documents: as quantified work items in the Bill of Quantity (BoQ) and as clauses in the Technical Specifications (TS). This forces the contractor to calculate costs and to execute them in a technically correct manner. To facilitate an environmental friendly construction, formation, cutting and permanent works must be tendered as one package. The responsibility for the tender procedure lies with the Operator and shall be ensured by ULB/KUIDFC. The work sequence for preparation of tender documents follows as below:

Construction scheduling – factors to consider...

- Overall scheduling to incorporate climatic factors
- Agricultural practices and harvesting seasons
- No use of Ground Water during Construction phase
- Source of Water for construction should be given by Contractor
- Traffic circulation plan should be prepared by contractor and approved by Traffic Management Authority
- Timing of specific activities to avoid special weather conditions
- Events of importance in the project area as festive seasons etc
- Availability of local labour during harvest seasons

- Bill of Quantity
  - preparation of work items list
  - calculation of quantities
  - preparation of schedule of rates

- Contract clauses

- special clauses
- technical specifications (ESMP and ECoPs)

The design and environmental considerations discussed above have to be incorporated suitably in the DPR and the bid document to ensure implementation. Towards this end, the following steps should be taken by the Operator.

Detailed Drawings if any for the environmental provisions as per the environmental codes of practice, as required, are to be included in the DPR viz., ECoP-1.0 (Project Planning & Design) laying of pipeline, construction of WTP and Construction of Reservoirs, ECoP-3.0, ECoP-5.0and ECoP 6.0. The DPR is to include specifications of the materials used and also the detailed bill of quantities in the bid document.

Cost implications of environmental measures suggested by the environmental codes of practice have to be included in the estimates for the project but the ULB are expected to make land available free of all encumbrance. Cost of restoration of common property resources, if any, as detailed in social management plan, are expected to be met by the ULB concerned. Monitoring arrangements towards the implementation of the environmental provisions are to be specified. The reporting formats are provided as per the ECoP-12.0, "Environment Monitoring and Audit".

The contractor is expected to submit for approval of the Operator, the general methods, arrangements, orders and timing for all the activities in the works along with monthly cash flow. In scheduling the construction works, it is expected that the contractor considers all the risks and schedule the activities, which are likely to be impacted by weather phenomenon in a period in which these phenomenon are unlikely to occur. The environmental concerns to be addressed in the preparation of DPR are detailed out in the Table 3 and Table 4.

Table 3: Environmental concerns in DPR preparation

S. No.	Activity	Items to consider	Measures to address	Detailed in
1	Topographic Survey	Trees	Inventorisation of environmental features Avoidance, design modifications to minimize adverse environmental impacts Incorporating community concerns into finalizing Pipeline alignment	**ECoP 1.0**
		Forest		
		Drainage lines / Rivers / water crossings		
		Irrigation water courses		
		Water bodies		
		Cultural properties		
		Utilities		
		Community facilities		
		Major junctions		
		Seasonal markets or cultural congregations		
		Location for stacking maintenance material		
		Location of areas for disposal of debris		

S. No.	Activity	Items to consider	Measures to address	Detailed in
		Identification of Agriculture land		
2	Detailed Surveys	Geological, geotechnical studies	Identification of flood prone areas and measures to avoid high afflux, social features Identification of agricultural use of land, Preparation of customer database	**ECoP 1.0**
		Topographical surveys		
		Customer surveys		
3	Water Availability for construction activities	Water availability	Identification of perennial/ community /private sources	**ECoP 5.0**
			Utilizing community water sources without conflict of uses	
4	Assessment of environmental impacts	Climatic factors	Scheduling construction considering the special weather phenomena	**ECoP 1.0**
		Water bodies	Protection of water bodies	ECoP 7.0
			Rehabilitation of water bodies	ECoP 7.0
		Soil erosion	Erosion control measures	**ECoP 14.0**
		Agriculture lands	Avoidance from setting up construction camps, pipe line route	ECoP 3.0,
		Ground Water	Ground water should not be utilized during construction phase	ECoP 5.0
			Ground water should be protected from leaching of oils and other pollutants	
		Cultural properties	Avoidance through design modifications	ECoP 12.0
			Planning for Relocation & Rehabilitation in unavoidable cases	
		Common Property Resources	Avoidance through design modification	ECoP 1.0
			Planning for Relocation in unavoidable cases with due approval from concerned authorities and as per procedure.	

S. No.	Activity	Items to consider	Measures to address	Detailed in
		Trees (if any)	Compensatory plantation & arrangements for roadside plantation	ECoP 1.0
		Forest areas (if any)	Avoidance through design modifications	ECoP 1.0
			Environment Management measures should be taken during construction	ECoP 9.0
5	Precautionary measures during construction to avoid environmental impacts			
		Construction sites	Provision of pollution control measures	ECoP 9.0
			All measures to ensure public & worker's health/safety	ECoP 10.0
			Waste Management	ECoP 6.0
		Public/workers health & safety	Personal Protective Equipment to be provided	ECoP 10.0
			Public safety at construction sites to be undertaken	
			Measures for worker's health & hygiene at construction camps	ECoP 3.0
6	Consultations with community	Water for construction	Agreements with owners/ community for utilizing water	ECoP 5.0
		Site for construction camps	Rehabilitation of the land after construction	ECoP 3.0
		Removal of trees (if any)	Tree Plantation	ECoP 1.0
		Cultural properties	Avoidance through modification Of Pipe line alignment	ECoP 12.0
			Relocation costs to be covered in the project, if needs relocation	ECoP 12.0
		Common property resources	Relocation, if needed in consultation with community	ECoP 1.0
		Traffic during construction	Provision of alternate routes or prior notice to	ECoP 11.0

S. No.	Activity	Items to consider	Measures to address	Detailed in
			the users or Traffic Management Authority	
7	Finalization of Pipe line alignment	Concerns of community	Community concerns to be incorporated	ECoP 1.0
		Environmental impacts identified	Impacts identified are to be mitigated by incorporation of provisions as per ECoPs	All ECoPs
		Design aspects	Impacts that can be mitigated through design modifications should be incorporated	ECoP 1.0
8	Preparation of Detailed drawings	All concerns/impacts identified	Designs for enhancements and mitigation measures including cost provisions	All ECoPs
9	Monitoring of Progress	All environmental aspects identified	Monitoring implementation of Environmental measures	ECoP 13.0

Table 4: Environmental Concerns during project implementation (to be identified in DPR)

S. No.	Activity and Sub Activity	Impacts	Measures to address	Detailed in
A	**Pre Construction/Start up Phase**			
A1	Alignment marking	**Nil**	Co-ordination with Revenue Department or ULBs	ECoP 1.0 ECoP 2.0
A2	Relocation of utilities	Impact on current usage	Intimate concerned utility authority in advance and obtain approval	ECoP 2.0
			Identification of relocation site in advance in consultation with utility authority.	
			Scheduling the activity in consonance with the community usage pattern	ECoP 2.0
A3	Tree Felling (If any)	Compliance with Forest Act	Prior clearance from Forest Department	ECoP 1.0
			Tree plantation	ECoP 1.0
A4	Clearance of land	Affects livelihood	As per project provisions RAP?	ECoP 2.0
		Impact on standing crops	Compensation as per Bank guidelines specified in RAP	ECoP 1.0
		Effect on cultural properties	Modification of alignment	ECoP 11.0
		Effect on natural habitats	Avoidance of natural habitats or preparation of Natural Habitat Management Plan	
A5	Transfer of land ownership	Grievances from community or Department	To be addressed through Grievance Redressal Mechanisms & Consultations	ECoP 1.0 ECoP 14.0

S. No.	Activity and Sub Activity	Impacts	Measures to address	Detailed in
		Affect on livelihood	Provision of entitlements as per resettlement framework	ECoP 1.0
A6	Location of Storage Yards, labour camps, and construction sites	Pollution from construction camps, storage yards & labour camps	Location criteria to be adopted	ECoP 3.0 ECoP 14.0
			Obtain clearances from ULB/Revenue authority	ECoP 1.0
		Pressure on local infrastructure	Infrastructure arrangements to be as per guidelines	ECoP 3.0
A7	Identification of designated locations of waste disposal	Pollution due to location close to settlements, water bodies & other sensitive areas	Site selection in conformance to criteria provided	ECoP 6.0
B	**Construction Activities/Transition Activities**			
B1	Dismantling of existing structure	Generation of Debris creating unsightly conditions	Disposal of waste and likely reuse	ECoP 6.0
B2	Planning Traffic diversions	Trampling of vegetation along traffic diversions	Trampling of vegetation along traffic diversions	ECoP11.0
B3	Transport of materials to site	Fugitive emissions from transport of -------- material	Covering of material with tarpaulin or use of covered box trucks during transport	ECoP6.0
		Dust emissions from haul roads	Haul road management	ECoP9.0
B4	Storage of materials	Contamination to water sources, leaching into ground water	Provision of impervious base to storage areas	ECoP 3.0
B5	Handling of earth	Dust rising and increase in particulate concentration in ambient air	Use of dust suppressants	ECoP9.0
B6	Handling of granular material	Risk of injury to workers	Use of Personal Protective Equipment	ECoP10.0
B7	Handling of bituminous materials	Leaching of materials, contamination of water sources	Provision of impervious base at bitumen storage areas and reuse of bitumen waste	ECoP 3.0 ECoP6.0
		Air pollution	Control of emissions from mixing	ECoP9.0
B8	Handling of oil/diesel	Contamination from accidental spills	Prevention of accidental spills, affecting cleaning immediately after spill	ECoP9.0
		Pollution due to incomplete burning	Ensure complete combustion of fuel through regular maintenance of equipment	ECoP9.0
B9	Waste management	Littering of debris at construction site	Waste to be disposed at disposal locations only/ utilized in pavement as	ECoP6.0

S. No.	Activity and Sub Activity	Impacts	Measures to address	Detailed in
			capping layer/ in sub-base or base course	
		Contamination of surroundings due to runoff from construction site	Prevention of runoff from entering water bodies	ECoP 7.0
B10	Operation of construction equipments and machinery	Air & Noise pollution	Conformance to Emission standards and norms	ECoP 9.0
		Operational safety of workers	Conformance to Safety concerns of the road users and workers in operation, first aid provision and mandatory provision of Personal Protective Equipment	ECoP10.0
B11	Movement of Machinery	Trampling of vegetation	Restriction of movement within ROW	ECoP 9.0
		Damage to flora & natural habitats	Minimizing impact on vegetation	ECoP 9.0
		Damage to road side properties	Minimizing impacts on private and common properties by using only the ROW	ECoP9.0
B12	Maintenance at construction camp	Collection of rainwater in construction camps	Temporary drains during construction	ECoP 3.0
		Waste water from labour camps	Disposal of waste water into soak pits	ECoP 3.0
		Contamination of soil	Removal of oil / other chemical spills & wastes	ECoP 3.0
C	**Post Construction/ O & M Phase**			
C1	Campsite restoration	Change of land use due to setting up of construction camp	Campsite to be restored to its original condition as per the rehabilitation plan	ECoP 3.0
C2	Dismantling of campsite	Waste generation at the construction site	Disposal of waste at designated locations	ECoP6.0

Operation and Maintenance (O & M)

Operation and maintenance of water supply systems, the following guidelines of the code elaborates on the requirements from the environmental perspective.

- A complete record of reports, estimates, drawings, maps and other details should be kept with the engineer in charge of the water supply system for the reference of operational staff.
- A systematic regular schedule of inspection of machinery and equipment, their lubrication and servicing programme should be prepared in line with the

recommendations of the equipment supplier and ensured that the same is implemented.

- A detailed map of the catchment area of the source (surface water) should be prepared and circulated to the staff at the head works. The catchment area should be inspected at regular intervals by the field staff and should identify the Potential sources of pollution in the catchment area, the type of pollution, origin, quality of such discharges etc.
- In case any significant source of pollution is identified a joint inspection of the engineer in charge and the regional officer of the pollution control board should be conducted and the quantity and the quality of the source and its impact on water supply should be ascertained and intimated to concerned authorities.. Appropriate steps to control the pollution should then be initiated by the authorities.
- No pesticide (e.g., herbicide) should be applied at the source and at the intake area without the prior written approval of the Engineer-in-charge.
- All the raw water holding structures such as intake wells, jack wells, inspection wells, etc. should be de-silted as per the maintenance schedule. The intake areas should be cleared of deep-rooted vegetation to prevent root growth from clogging intake lines. However, it is advantageous to encourage the growth of grasses and other vegetation for erosion control on the slopes of the banks and to inhibit the growth of more detrimental flora.
- Water samples should be collected daily from various locations of the source and should be analyzed for critical parameters such as pH, Turbidity, Suspended Solids, Chlorides and bacteriological quality. Appropriate dosage of coagulant and the disinfectant should then be decided based on the results of the analysis. Water Quality Surveillance Program as specified in the Operator Contract shall be followed.
- The operation and maintenance of the transmission mains should be carried.
- Regular leak detection survey of the transmission mains as approved in the Service Improvement Plan should be carried out to assess the level of leakages in the system and potential areas of cross contamination.
- A detailed record of breakdowns and leaks observed should be maintained section-wise so that more vulnerable lengths could be identified and special measures to repair/replace should be undertaken
- A regular schedule of inspection and attendance to all valves including air and scour valves should be drawn up and the same should be followed.
- A qualified and experienced Water Supply engineer should be the in charge of operation and maintenance of water treatment plants.
- The operation and maintenance of the plant should be carried out in a manner that ensures that the designed quality of water is available from the treatment plant to the distribution system and prevents emergencies or unscheduled shutdowns.
- As a preliminary step, an operational manual that clearly explains the basic operation and maintenance of the treatment plant should be prepared by the design consultant

and should be provided to plant operator for regular reference. The manual should provide the following.

- specifications of all the plant and equipment in the treatment plant
- explain functions and operational requirements of each unit of the plant
- a full set drawings including the lay out, hydraulic flow diagram., position of pipe lines and appurtenances, of the plant
- systematic plan of daily operations and
- instruction for operation and maintenance of the system

- The raw water samples from the source should be collected and analysed for the critical parameters. The results of these samples should form the basis for the deciding the dosage of flocculent and disinfectant.
- Chemicals such as chlorine, ferric chloride, sodium hydroxide, sulphuric acid, ammonium chloride, ammonia, sulphur dioxide and sodium bisulphate should be handled by equipment, specially designed to reduce handling hazards to a minimum.
- The optimum dosing of coagulant should be based on a proper laboratory study of the raw water including jar test and in no case alum is just dumped in the raw water channel.
- The Flocculator paddles should be operated continuously for avoiding sludge build-up in the system. In non-mechanical type flocculator with baffles, the sludge should be removed once in six months.
- The following measures should be ensured in the Clarifier or Sedimentation Tank.
  - Sludge line should be kept free of choakages and should be flushed with high-pressure water if choakage is noticed.
  - The units should be worked continuously to protect the mechanical parts from ill-effects of corrosion, malfunctioning etc., as well as problem of sludge build-up.
  - Algaecide or bleaching powder may be used for controlling biological growth on weirs
- The wastewater drains of filter back wash should be kept free of clogging or sediments to avoid back flow into the filter beds and the frequency of backwashing should be strictly based on the head loss measurements and turbidity of water, but not arbitrary.
- Wherever possible, sludge generated from the treatment plant should be reclaimed and reused for the following purposes.
  - Reuse of lime softening plant sludge by calcining.
  - Recovery of alum from sludge by treatment with sulphuric acid to reduce the quantity of sludge to be handled
  - Recycling of backwash water to plant inlet

In other instances, the sludge from clarification units using iron and aluminium coagulants can be dewatered by vacuum filtration using lime as the conditioner and the cakes so formed should be disposed in a secured land fill.

- The quality of water discharged into the distribution system should be monitored and evaluated with the water quality standards of IS 10500 and other parameters prescribed

in this code. The daily records of the water quality should be maintained by the in-charge of the water treatment plant for regular monitoring.

- Chlorine after treatment must be injected in sufficient quantity to yield detectable free chlorine residual or detectable combined chlorine residual in the distribution system and the residual chlorine checks should be carried out daily by the person in-charge of the disinfection.
- The storage reservoir should be disinfected before supplying water to the distribution system.
- General cleanliness in and around the storage reservoirs should be maintained and a garden if space is available should be provided.
- The reservoirs should be cleaned at least once in a year and provisions to bypass the supply to distribution system during such cleaning process should be provided in the system.
- The openings of ventilating shafts and overflow pipes should be properly closed and protected with wire gauge to prevent from external pollution.
- Special inspections should be carried out at regular intervals on pipelines passing through marshy or high water table areas, crossings across waste channels, pipes and in the vicinity of sewers, storm water drains, etc. to detect possible cross contamination of the system. These critical locations should be identified on based on superimposing the distribution system and the city infrastructure map and locations should be short-listed for conducting water quality analysis.
- Irrespective of the above critical locations, water samples should be collected from various locations of the city in such a way that every kilometre of the distribution system is sampled at least once in a month. These samples should be in addition to the regular sampling done by the operating agency in response to the complaints received.
- Leaks and damages detected should be promptly repaired. The causes of wastage through leakage must be ascertained. A regular programme of leak detection must be undertaken such that each section of the system comes up for leak detection at least once in three years.
- The operating agency should not allow a connection to the water supply system, which may jeopardize the quality and integrity of the network. Cross connections should not be allowed unless controlled by an approved and properly operating backflow prevention assembly. A strict monitoring and inspection program should be in place for this purpose and any illegal connections in the system should be prevented.
- The operating agency should maintain an inventory of each pressure atmospheric vacuum breaker, double check valve, reduced pressure zone principle assembly, and high hazard air gap used by their customers, and a service record for each such assembly. Backflow prevention assemblies must be inspected and tested at least once a year.
- In addition to the above water sampling, monitoring of consumer comments and complaints can provide valuable information on potential problems that may have gone unidentified in performance monitoring of the water supply system. Consumer satisfaction survey of drinking water quality should be done annually by specialized

agencies. These surveys should be focused to assess the consumer response on the aesthetic quality of water supplied (which usually means that the water supplied is colourless and free from suspended solids and unpleasant taste or odour). The results of the above survey should lead to a consumer complaint and response program, which details out mechanisms for logging, recording and evaluating consumer complaints and prompt response to any potential problems in the water supply system.

- The personnel who are already available or chosen to carry out the actions contained in the programme may have to be trained through special courses or by "on the job training" to ensure that these personnel are thoroughly trained to carry out the actions listed in the plan of maintenance.

Include in the bid document, as a special condition clause stating that all provisions of guideline shall be applicable to the locations of construction camps.

3 ECoP 2.0: Site Preparation

The preparation of site for construction involves: (i) Marking and clearance of the required Right of Way (RoW) of all encroachments by the PIU prior to mobilization of Contractor; (ii) Informing the local community about construction schedule and (iii) Site preparation by the contractor prior to commencement of construction. Scope of this ECoP includes only the measures to address environmental concerns expected during the site preparation. The land acquisition and resettlement issues involved are to be addressed by ULB as per the provisions of the Resettlement and Participatory Framework for the project.

Site Preparation Activities by the PIU

- After obtaining the consent of the ULB/KUIDFC on the alignment, the Operator shall be responsible to stake out the alignment. It shall be the responsibility of the PIU to take over the possession of the proposed RoW and hand over the land width required clear of all encumbrances to the Operator who shall establish bench marks on ground.
- Activities pertaining to the clearance of land and relocation of utilities need to be initiated by the Operator well in advance by contacting concerned departments to avoid any delays in handing over of site to the Contractor. Assistance of the ULB/Revenue Department shall be sought in accomplishing the task. A MoU to this effect could be signed between the PIU and the Revenue Department.

PIU's responsibilities before handing over site…

- Clearance of encroachments within proposed RoW
- Initiation of process for legal transfer of land title
- Alignment modification or relocation of common property resources in consultation with the local community
- Alignment modification or relocation/removal of utilities in consultation with the various government departments and
- Obtain clearances required from government agencies for felling of trees and diversion of forest land parcel.
- Informing the community about the likely schedule of construction

Site Preparation Activities by the Contractor

- The contractor shall submit the schedules and methods of operations for various items during the construction operations to the Operator for approval. The Contractor shall commence operations at site only after the approval of the schedules by the Operator. Operator shall also keep the community/ ULBs informed about the likely mile-stones of the achievement and causes of delays, if any.
- The clearance of site shall involve the removal of all materials such as trees, bushes, shrubs, stumps, roots, grass, weeds, part of topsoil and rubbish. Towards this end, the Contractor shall adopt the following measures: (i) Limiting the surface area of erodable earth material exposed by clearing
- To minimize the adverse impact on flora and vegetation, only ground cover/shrubs that impinge directly on the permanent works shall be removed. Cutting of trees and vegetation outside the working area shall be avoided under all circumstances. In case the alignment passes through forest areas, Forest Ranger shall be consulted for identification of presence of any rare/endangered species within the proposed road

way. Protection of such species if found shall be as per the directions of the Forest Department.

- The locations for disposal of grubbing waste shall be finalized prior to the start of the works on any particular section of the road. The selection of the site shall be approved by the PIU. The criteria for disposal of wastes shall be in accordance with ECoP 6.0 -"Waste management".
- Dismantling of existing structures shall be carried out in a manner as not to damage the remaining required portion of structures and other surrounding properties. The disposal of wastes shall be in accordance with the provisions of ECoP- "Waste management". The following precautions shall be adopted: (i) The waste generated shall not be disposed off in watercourses, to avoid hindrance to the flow, and (ii) All necessary measures shall be taken while working in densely populated areas to prevent earthwork, stonework as well as the method of operation from impeding traffic or public, damaging adjacent buildings and structures. The contractor shall also ensure high barricading and adequate protection to ensure public safety.
- The designated sites duly approved by Implementing Agency shall be cleared of its existing cover for setting up of the construction sites, camps and related infrastructure facilities, borrow areas and other locations identified for temporary use during construction. The contractor shall comply with all safety requirements in consideration as specified in ECoP 10.0 -"Public & Worker's Health and Safety". Before initiation of site preparation activities along these lands to be used temporarily during construction, it shall be the responsibility of the Contractor to submit and obtain approval of the site restoration plan from the implementing agency. The letter/contract agreement between the owner(s) of the land parcel for temporary usage shall include site restoration to its original status. The guidelines for the same are furnished in ECoP 9.0 -"Construction Plants & Equipment Management" and ECoP 3.0-"Construction Camps".
- All regulatory clearances shall be obtained before actual start of work on any stretch. The contractors shall seek compliance of the applicable regulation/s prior to mobilization.

Traffic management during construction

Traffic management during construction is an activity specific to the contractors. Contractors must ensure a reasonably smooth flow of traffic during construction. The following are the general principles to be followed for traffic management during construction:

- Partial laying of pipes over long lengths will not be permitted. The contractor should concentrate his activities over sections such that he can complete continuous fronts of up to a maximum of 1 km before starting the adjacent front. The contractor may open more than one continuous 1 km front provided that he has the separate resources to do so. The resources working on a 1 km front may not be shifted to another front until no longer required on that front.
- The construction activities should be staggered over sub-sections to the extent that the use of plant and equipment is optimized to maximum

efficiency and to avoid idling. Laying of pipes on parallel side of the existing road shall not be permitted on both sides simultaneously.

- Earthworks must be back filled and restored to the level of the existing road before excavation work on the opposite side will be permitted.
- The construction operations taking place on a particular front must be managed efficiently such that delays between laying of pipes and back filling are minimized.
- Before the start of the monsoon season the contractor shall ensure that the restoration works on any front is complete. . The contractor should not start any sections that he cannot complete by the start of the monsoon season.
- In the absence of permanent facilities, temporary drainage and erosion control measures, as required by the Specifications, are to be implemented prior to the onset of the monsoon.

In cases where separate traffic diversions are not essential or cost effective the construction methodology should be in accordance with the guidelines following:

- On a 1 km section, the laying of pipes (except new alignments) should be limited to 500m

  Sub sections with a minimum of 1 to 1.5 km between successive sub-sections to ease traffic management and safety issues.
- Excavation on both sides of the existing, road over the same sub-section simultaneously shall not be permitted for reasons of safety to the traffic, particularly at night.
- Sub-sections longer than 500 m may be authorized by the Engineer if two-way traffic flow can be comfortably managed and the Contractor can demonstrate his ability to maintain dust control, proper road edge delineation, proper signage and traffic control.

Where single file traffic is permitted the sub-sections shall be reduced to a maximum length whereby safe traffic regulation can be physically managed. Single file traffic may not be permitted at certain locations or times of the day when traffic volumes are such that excessive congestion shall occur.

4 ECoP 3.0: Construction Camps Management

The terms and conditions of this ECoP pertain to the siting, development, management and restoration of construction camps to avoid or mitigate impacts on the environment. The area requirement for the construction camp shall depend upon the size of contract, number of labourers employed and the extent of machinery deployed.

Selection or construction camp/site locations

Avoid the following	Prefer the following
• Lands within 500m of habitations • Irrigated agricultural lands • Lands belonging to small farmers • Lands under village forests • Lands within 100 m of community water bodies and water sources as rivers • Lands within 100 m of watercourses • Low lying lands, marshy areas Lands supporting dense vegetation • Grazing lands and lands with tenure rights • Lands where there is no willingness of the landowner to permit its use	• Waste lands • Lands belonging to owners who look upon the temporary use as a source of income • Community lands or government land not used for beneficial purposes • Private non-irrigated lands where the owner is willing and • Lands with an existing access road

IMPACTS AND MITIGATION MEASURES:

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Siting and Location of construction camps	Campsites for construction workers are the important locations that have significant impacts such as health and safety hazards on local resources and infrastructure of nearby communities.	The Contractor shall • Locate the construction camps at areas which are acceptable from environmental, cultural or social point of view. • Consider the location of construction camps away from communities in order to avoid social conflict in using the natural resources such as water or to avoid the possible adverse impacts of the construction camps on the surrounding communities. • Local authorities responsible for health, and law and order shall be duly informed on the set up of camp facilities so as to maintain effective surveillance over public health, social and security matters

Construction Camp Facilities	Lack of proper infrastructure facilities such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	Contractor shall provide the following facilities in the campsites • Adequate housing for all workers • Safe and reliable water supply that meets the national standards • Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. Provide separate latrines and bathing places for males and females with total isolation by wall or by location. The minimum number of toilet facilities required is one toilet for every fifteen persons. • Provide in-house community/common entertainment facilities.
Disposal of waste	Management of wastes is crucial to minimize impacts on the environment	The Contractor should • Ensure proper collection and disposal of solid wastes within the construction camps • Insist waste separation by source; organic wastes and inorganic wastes to be seperated • Store inorganic wastes in a safe place within the camp and clear organic wastes on daily basis to waste collector. Establish waste collection, transportation and disposal systems with the manpower and equipments/vehicles needed • Locate the garbage pit/waste disposal site min 500 m away from the residence so that peoples are not disturbed with the odor likely to be produced from anaerobic decomposition of wastes at the waste dumping places. Encompass the waste by fencing and tree plantation to prevent children to enter and play with. • Do not establish site specific landfill sites. All solid waste will be collected and removed from the work camps and disposed in approved waste disposal sites

Health and Hygiene	There will be a potential for diseases to be transmitted including malaria, exacerbated by inadequate health and safety practices.	The Contractor shall • Provide adequate health care facilities within construction camps. • Provide first aid facility round the clock. Maintain stock of medicines in the facility and appoint fulltime designated first aider or nurse. • Provide ambulance facility for the laborers during emergency to be transported to nearest hospitals. • Initial health screening of the labourers coming from outside areas • Provide adequate drainage facilities throughout the camps to ensure that disease vectors such as stagnant water bodies and puddles do not form. Regular mosquito repellent sprays during monsoon. • Carryout short training sessions on best hygiene practices to be mandatorily participated by all workers. Place display boards at strategic locations within the camps containing messages on best hygienic practices

The role and responsibility has been defined for different activities (Pre, construction and post construction phase) as shown below:

Table 4:

Sr. No.	Activity	Site Responsibility	Monitoring Responsibility
Pre-Construction Stage/Start up Phase			
1	Identify the site for construction camp in consultation with the individual owners in case of private lands and the revenue department in case of government lands (**Use Format-1**).	Contractor and Operator	The suitable sites shall be selected and finalized in consultation with the PIU/SPV or his appointed representative not below the rank of Executive Engineer (EE)
2	Work out arrangements for setting up his facilities during the duration of construction with the land owner	Contractor and Operator	Arrangements will be verified by the EE of PIU/SPV or his appointed representative not below the Assistant Executive Engineer (AEE) to enable redressal of grievances at a later stage of
3	The arrangements will include the restoration of the site after the completion of construction	Contractor and Operator	

Sr. No.	Activity	Site Responsibility	Monitoring Responsibility
			the project.
4	Submit a detailed layout plan for development of the construction camp, indicating the various structures to be constructed including the temporary structures to be put up, site roads, drainage, lighting and other facilities	Contractor and Operator	The plan shall be finalized or approved by the EE of PIU/SPV or his appointed representative not below the rank of AEE
5	The plan will include the redevelopment of sites to pre-construction stage. The campsite should cover an area of about 3000 sq. m for 60 Nos. of workers.	Contractor and Operator	
6	Submit following documents for arrangement with landowners:- – Written No-objection certificate of the owner Extent of land required and duration of the agreement – Photograph of the site in original condition – Details of site redevelopment after completion	Contractor and Operator	The documents shall be checked or approved by the PIU/SPV or his appointed representative not below the rank of AEE
7	Provide, free of cost in the camp site, temporary living accommodation to all the workers employed by contractor for such a period as the construction maintenance work is in progress	Contractor and Operator	Monitoring by the EE of PIU/SPV or his appointed representative not below the rank of AEE
8	Provide for a sufficient supply of potable water in the construction camps	Contractor and Operator	
9	Identify suitable community water sources as hand pumps and ponds for procuring drinking water, in consultation with the PIU/SPV.	Contractor and Operator	
		Contractor and Operator	
11	– Every water supply or storage shall be at a distance of not less than 15m from any Wastewater / sewage drain or other source of pollution. – Water sources within 15m proximity of toilet, drain or any source of pollution will not be used as a		

Sr. No.	Activity	Site Responsibility	Monitoring Responsibility
	source of drinking water in the construction camp		
12	Every site adequate and suitable facilities for washing clothes and utensils shall be provided	Contractor and Operator	Monitoring by the EE of PIU/SPV or his appointed representative not below the rank of AEE
13	Separate and adequate bathing facilities shall be provided for the use of male and female workers. Such facilities shall be conveniently accessible and shall be kept in clean and hygienic conditions.	Contractor and Operator	
14	Sanitary arrangements, latrines and urinals shall be provided in every work place on the following scale: • Where female workers are employed, there shall be at least one latrine for every 15 females or part thereof. • Where males are employed, there shall be at least one latrine for every 15 males or part thereof. • Every latrine shall be under cover and so partitioned off as to secure privacy, and shall have a proper door and fastenings. • Where workers of both sex are employed, there shall be displayed outside each block of latrine and urinal, signage understood by the majority of the workers "For Men Only" or "For Women Only" as the case may be. • The latrines and urinals shall be adequately lighted and shall be maintained in a clean sanitary condition at all times and • Water shall be provided in or near the latrines and urinals by storage in drums.	Contractor and Operator	Monitoring by the EE of PIU/SPV or his appointed representative not below the rank of AEE
15	**Arrangements for Waste Disposal** • Disposal of sanitary Wastes and excreta shall be into septic tanks. • Kitchen Wastes shall be disposed into soak pits. Wastewater from campsites will be discharged and	Contractor and Operator	Monitoring by the EE of PIU/SPV or his appointed representative not below the rank of AEE

Sr. No.	Activity	Site Responsibility	Monitoring Responsibility
	disposed in a kitchen sump located at least 15 meters from any body of water. Sump capacity should be at least 1.3 times the maximum volume of Wastewater discharged per day. The bottom of the pit should be filled with coarse gravel and the sides shored up with board, etc. to prevent erosion and collapse of the pit. • Solid Wastes generated in the construction site shall be reused if recyclable or disposed off in designated land fill sites		
16	**First Aid Facilities** • First Aid Box will be provided at every construction campsite and under the charge of a responsible person who shall always be readily available during working hours of the work place. It will be adequately trained in administering first aid-treatment. Formal arrangement shall be prescribed to make motor transport available to carry injured person or person suddenly taken ill to the nearest hospital.	Contractor and Operator	Monitoring by the EE of PIU/SPV or his appointed representative not below the rank of AEE
17	**Storage Site** • **Storage of Petrol/Oil/Lubricants:** Brick on edge flooring or sand flooring will be provided at the storage places of Petrol/Oil/Lubricants to avoid soil and water contamination due to spillage. • **Storage of cement**: Damp-proof flooring, as per IS codes • **Storage of blasting materials:** Shall be as per the specific provisions of Explosives Act.	Contractor and Operator	Monitoring by the EE of PIU/SPV or his appointed representative not below the rank of AEE
18	**Fire fighting arrangements** • Demarcation of area susceptible to fires • Provision of cautionary signage • Portable fire extinguishers and sand baskets shall be provided at easily accessible locations in the event of	Contractor and Operator	Monitoring by the EE of PIU/SPVor his appointed representative not below the rank of AEE

Sr. No.	Activity	Site Responsibility	Monitoring Responsibility
	fire • Workers shall be trained on the usage of such equipment/s.		
19	**Interactions with host communities** • Issue identity cards to labourers and residents of construction camps.	Contractor and Operator	Monitoring by the EE of PIU/SPV or his appointed representative not below the rank of AEE
Construction Phase/Transition Phase			
1	– Construction camps shall be maintained free from litter and in hygienic condition. – It should be kept free from spillage of oil, grease or bitumen. – Any spillage should be cleaned immediately to avoid pollution of soil, water stored or adjacent water bodies Following precautions need to be taken in construction camps. – Measures to ensure that no leaching of oil and grease into water bodies or underground water takes place – Wastewater should not be disposed into water bodies – Regular collection of solid Wastes should be undertaken and should be disposed off safely – All consumables as the first aid equipment, cleaning equipment for maintaining hygiene and sanitation should be recouped immediately	Contractor and Operator	EE or his appointed representative not below the rank of AEE will monitor the cleanliness of construction campsites and ensure that the sites are properly maintained throughout the period of the contract.
Post Construction Phase/ O & M Phase			
1	– At the completion of construction, all construction camp facilities shall be dismantled and removed from the site – The site shall be restored to a condition in no way inferior to the condition prior to commencement of the works (**Use Format 2**) – Written No-objection certificate of the owner for having restored the site. Various activities to be carried out for site restoration are: – Oil and fuel contaminated soil shall	Contractor and Operator	The restored site shall be inspected by the EE and will issue "Restoration Certificate". The same shall be obtained before final payment is claimed.

Sr. No.	Activity	Site Responsibility	Monitoring Responsibility
	be removed and transported and buried in Waste disposal areas. – Construction campsite shall be grassed and trees cut replaced with saplings of similar tree species. – Saplings planted shall be handed over to the community or the land owner for further maintenance and watering – Soak pits and septic tanks shall be covered and effectively sealed off.		

Include in the bid document, as a special condition clause stating that all provisions of guideline shall be applicable to the locations of construction camps.

Format 1: Setting-up Construction Camp and Storage Area

(To be filled by Contractor)

1. **Name of Work**.....
2. **Name of Nearest Human Settlement**.....
3. **Location of Camp**.....

Sr. No.	Item	Unit	Detail	Remarks by PIU/Contractor (If any)
1.	**Detail of Construction Camp**			
a.	Area of Camp			
b.	Distance from Nearest Habitation			
c.	Distance from nearest water source			
d.	Details of storage area			
e.	Availability of separate Waste disposal from storage area			
2.	**Details of Workforce**			
a.	Total No. of Workers			
b.	Total No. of Male workers			
c.	Total No. of Female workers			
d.	No. of Children			
3.	**Details of dwellings units**			
a.	No. of dwellings units			
b.	Source of Drinking Water			
c.	Total No. of bathrooms			
3.	**Details of Facilities**			
a.	Details of First Aid facility			
b.	Availability of Dustbins			

Remarks:.....

Submitted **Checked** **Approved**

Signature ....

Name ....

Designation ....

Contractor **Operator** **Assistant Executive Engineer PIU** **Executive Engineer, PIU**

Format 2: Restoration of Construction Site

(To be filled by the Contractor)

1. **Name of Work……**
2. **Name of Nearest Human Settlement……**
3. **Date of Submission……**

S. No.	Contract Package	Labor Camp		Construction Camp		Plant Site		Borrow Areas		Disposal Location		Top Soil	
		O	R	O	R	O	R	O	R	O	R	Preserved	Restored

Remarks:……

……

Submitted **Checked** **Approved**

Signature **……** **……** **……**
Name **……** **……**
Designation **……** **……**

Contractor **Operator** **Assistant Executive Engineer PIU** **Executive Engineer, PIU**

5 ECoP 4.0: Alternate Materials for Construction

The use of alternate materials for construction focuses on the management and reuse of waste materials locally available in the project area with the added advantage of economizing the project cost in case lead for usual road materials is high.

Project Preparation Stage/Start up Phase

- During the DPR stage, the sources and suitability of alternate materials should be identified. In case of availability of alternate materials, the DPR shall specify the following: (i) Characteristics and availability of the material (ii) Possibility of use in the project (iii) Methods of testing, specifications, recommended usage and (iv)Mechanism for procuring and transporting to the site. The feasibility of its use shall be based on the lead from the project corridor, suitability of the material and the extent of use.
- The Operator must ensure that provision shall be made in bid document under special conditions of contract specifying the use of fly ash, if available in the vicinity of the project area as per the central government directive on the said subject.
- A separate BoQ should be included for alternate materials in case they are available in the proximity of the project area and the Operator proposes to include their use for a particular sub project.

Pre-construction Stage/Start up Phase

- Testing shall be done as per IS specifications, in order to evaluate suitability of the alternate materials. In case test results do not match the specifications; option of blending the material with standard materials to meet the required specifications should be explored. The Operator must ensure that the use of alternate material is as per specifications.
- The Contractor shall approach the supplier identified based on lead and material suitability and shall sign an agreement specifying the quantity of the material to be procured.

Construction Stage/Transition Phase

- Care should be taken that all the loose material (fly ash, quarry overburden) are covered to avoid fugitive emissions and spillage during transportation.
- In case of transporting slag as well as marble slurry, free board should be maintained and tailboard should be properly closed and sealed.
- While storing materials, Contractor shall undertake all precautionary measures to prevent leaching/spillage of the materials.

6 ECoP 5.0: WATER RESOURCES MANAGEMENT

A. WATER FOR CONSTRUCTION:

The section pertains to obtaining water required for construction. Except bituminous works, water is required during all stages of construction such as WTP and Reservoirs.

Project Planning and Design Stage/Start Up Phase

The Detailed Project Report shall contain the following information:

- Estimate of water requirement based on construction schedule of various stages of the project
- Identification of potential sources of water for construction

In water-scarce regions, provide the following additional information in DPR...

- Exploring possibilities for use of existing perennial sources, through interactions with water user groups as the community and the Government Department, keeping in view that the water extraction does not infringe upon the usufruct rights of the existing water users.
- Identification of potable water source for domestic use of workers and for use in cement – based construction such as WTP and reservoirs.

- Arrangements to be worked out by the contractor with individual owners, when water is to be obtained from private sources (which would then be reflected in the Bidding Documents)
- Permits required, if any for opening up new sources, as per the requirements of the existing statutory provisions, and
- Whether scarcity of water would have any impact on schedule of construction.
- Scheduling Construction in Water Scarce Areas: As part of the project preparation, Operator shall conduct an assessment of water requirement and availability in water scarce regions.

Pre-construction stage/Start Up Phase

- Prior to commencement of extraction of water for construction, the contractor shall work out arrangements as specified in the DPR.
- In case of community water sources, the Contractor will carry out consultations and obtain written consent of ULBs for extraction of water through written arrangements with the ULB towards the same.
- In case of private water sources, the Contractor shall not commence procurement of water from a source unless and until the written consent of all current registered owners of the parcel or parcels on which the source is located has been obtained.
- Ground Water will not be use for construction; the Contractor shall submit an affidavit on no use of ground water to PIU/ULBs.

Construction Stage /Transition Phase

During construction, the Contractor shall be responsible to monitor the following:

- The arrangements worked out with the ULB/individual land owners for water extraction is adhered to.

- Extraction of water is restricted to construction requirement and for domestic use of construction workers.
- Water requirement for curing of concrete shall be minimized by pooling of water over the concrete or by covering with wet gunny bags.
- The potable water used for drinking purposes of construction workers shall be as per the Indian Standard for Drinking Water IS: 10500, 1991.

Prior to issuing project completion certificate to the contractor, the PIU shall verify that the premises of water extraction points are restored to their original status after construction.

B. IMPACTS AND MITIGATION MEASURES

Project Activity/ Impact Source	**Environmental Impacts**	**Mitigation Measures/ Management Guidelines**
Discharge from construction sites	During construction both surface and groundwater quality may be deteriorated due to construction activities in the waterway/river, sewerages from construction sites and work camps. The construction works will modify groundcover and topography changing the surface water drainage patterns of the area including infiltration and storage of storm water. These changes in hydrological regime lead to increased rate of runoff increase in sediment and contaminant loading, increased flooding, ground water contamination, and effect habitat of fish and other aquatic biology.	The Contractor shall • Install temporary drainage works (channels and bunds) in areas required for sediment and erosion control and around storage areas for construction materials • Install temporary sediment basins, where appropriate, to capture sediment-laden run-off from site • Divert runoff from undisturbed areas around the construction site • Stockpile materials away from drainage lines • Prevent all solid and liquid wastes entering waterways by collecting solid waste, oils, chemicals, bitumen spray waste and wastewaters from brick, concrete and asphalt cutting where possible and transport to an approved waste disposal site or recycling depot • Wash out ready-mix concrete agitators and concrete handling equipment at washing facilities off site or into approved bunded areas on site. Ensure that tires of construction vehicles are cleaned in the washing bay (constructed at the entrance of the construction site) to remove the mud from the wheels. This should be done in every exit of each construction vehicle to ensure the local roads are kept clean.

Soil Erosion and siltation	Soil erosion and dust from the material stockpiles will increase the sediment and contaminant loading of surface water bodies.	The Contractor shall • Stabilize the cleared areas not used for construction activities with vegetation or appropriate surface water treatments as soon as practicable following earthwork to minimize erosion • Ensure that roads used by construction vehicles are swept regularly to remove sediment. • Water the material stockpiles, access roads and bare soils on an as required basis to minimize dust. Increase the watering frequency during periods of high risk (e.g. high winds)
Construction activities in water bodies (eg: Headworks)	Construction works in the water bodies will increase sediment and contaminant loading, and effect habitat of fish and other aquatic biology.	The Contractor Shall • Monitor the water quality in the runoff from the site or areas affected by dredge plumes, and improve work practices as necessary • Protect water bodies from sediment loads by silt screen or bubble curtains or other barriers. • Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, storm water systems or underground water tables. • Use environment friendly and nontoxic slurry during construction of piles to discharge into the river. • Reduce infiltration of contaminated drainage through storm water management design • Do not discharge cement and water curing used for cement concrete directly into watercourses and drainage inlets
Drinking water	Depletion and pollution of groundwater resources.	The Contractor shall • Safe and sustainable discharges are to be ascertained prior to selection of source of water • Tube wells will be installed with due regard for the surface environment, protection of

		groundwater from surface contaminants, and protection of aquifer cross contamination • Protect groundwater supplies of adjacent lands • Obtain permits, if any, from authorities concerned for installing tube wells.

7 ECoP 6.0: Waste Management Plan

The procedures for this ECoP are for handling, reuse and disposal of Waste materials during construction. The Waste materials generated can be classified into (i) Construction Waste and (iii) Domestic Waste.

Project Activity/ Impact Source	**Environmental Impacts**	**Mitigation Measures/ Management Guidelines**
General Waste	Soil and water pollution from the improper management of wastes and excess materials from the construction sites.	The Operator shall ensure that the Contractor shall develop waste management plan for various specific waste streams (e.g., reusable waste, flammable waste, construction debris, food waste etc.) prior to commencing of construction and submit to PIU/SPV for approval. • Organize disposal of all wastes generated during construction in an environmentally acceptable manner. This will include consideration of the nature and location of disposal site, so as to cause less environmental impact. • Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach. • Segregate and reuse or recycle all the wastes, wherever practical. • Prohibit burning of solid waste • Collect and transport non-hazardous wastes to all the approved disposal sites. Vehicles transporting solid waste shall be covered with tarpaulins or nets to prevent spilling waste along the route • Provide dustbins/refuse containers at each worksite. • Request suppliers to minimize packaging where practicable. • Maintain all construction sites in a cleaner, tidy and safe condition and provide and maintain appropriate facilities as temporary storage of all wastes before transportation and final disposal.
Hazardous Waste	Health hazards and environmental impacts due to improper waste management practices	The Contractor shall • Collect chemical wastes in 200 litre drums (or similar sealed container), appropriately labelled for safe transport to an approved chemical waste depot.

		• Store, transport and handle all chemicals avoiding potential environmental pollution. • Store all hazardous wastes appropriately in bunded areas away from water courses. • Make available safety guidelines for handling of hazardous materials on-site during construction. • Collect hydrocarbon wastes, including lube oils, for safe transport off-site for reuse. •

The role and responsibility has been defined for different activities (Pre, construction and post construction phase) as shown below:

Table 5:

Sr. No.	Activity	Site Responsibility	Monitoring Responsibility
Project Planning and Design Stage/Start up Phase			
1	Carry out the following activities as part of DPR: • Finalize design to minimize Waste generation through balancing of cut and fill operations and minimizing excess cuts requiring disposal. • Identify the type of Wastes as well as sources of Waste during construction and suggest options for possible reuse • Provide guidelines to the contractor for locating Waste disposal sites for non-toxic Wastes • Identify existing landfill sites if available for disposal of toxic materials. • In case no existing landfill sites are available, identification of landfill site as well as decommissioning of	Operator	EE of PIU/SPV or his appointed representative not below the rank of AEE

	these sites should be undertaken. Towards this, identify the clearance requirements. • Include in the bid document a special condition clause stating that all provisions shall be applicable to the locations of disposal of Wastes		
Pre Construction Stage/Start up Phase			
1	Identify the activities during construction, that have the potential to generate Waste and work out measures for the same in the construction schedule to be submitted to the EE or his appointed representative not below the rank of AEE	Contractor and Operator	Arrangements will be verified by the EE of PIU/SPV or his appointed representative not below the rank of AEE to enable redressal of grievances at a later stage of the project.
2	For the disposal of excess cut and unsuitable (non-toxic) materials, the contractor shall identify the location for disposal in consultation with the community (**Use Format-3**)	Contractor and Operator	
3	Any toxic materials shall be disposed as per the with legislative requirements	Contractor and Operator	The documents shall be checked or approved by the EE or his appointed representative not below the rank of AEE
4	Prior to disposal of Wastes onto private/community land, it shall be the responsibility of the Contractor to obtain a No-objection Certificate (NOC) from the land owner/community.	Contractor and Operator	
6	Educate his workforce on issues related to disposal of Waste, the location of disposal site as well as the specific requirement for the management of these sites.	Contractor and Operator	Monitoring by the EE or his appointed representative not below the rank of AEE
Construction & Post Construction Phase/ Transition and O&MPhase			
1	– Either reuse or dispose the Waste generated during construction depending upon the nature of Waste, as specified in **Table 6.** – The reuse of Waste shall be	Contractor and Operator	The Waste management practices adopted by the Contractor, including the management of Wastes at

	carried out by the contractor only after carrying out the specific tests and ascertaining the quality of the Waste materials used, and getting the same approved by the EE. The contractor shall adopt the following precautions while reusing Wastes for construction: • In case of bituminous Wastes, dumping will be carried out over a 60 mm thick layer of rammed clay so as to eliminate any chances of leaching. • In case of filling of low-lying areas with Wastes, it needs to be ensured that the level matches with the surrounding areas. In this case care should be taken that these low lying areas are not used for rainwater storage • In case oil and grease are trapped for reuse in a lined pit, care shall be taken to ensure that the pit should be located at the lowest end of the site.		construction camps, etc. The work shall be reviewed by the EE on random sampling basis during the progress of construction.
Post Construction Phase/O&M Phase			
1	– Hand over the site after clearing the site of all debris/Wastes to the EE or his appointed representative not below the rank of AE – In case of disposal of Wastes on private land, certificate of Completion of Reclamation is to be obtained by the Contractor from the landowner that "the land is restored to his satisfaction" (**Use Format 2**)**.**	Contractor and Operator	– Inspected by the EE or his appointed representative not below the rank of AEE. – The same is to be submitted to the EE before final payment is claimed.

Table 6: Type of Wastes and scope for reuse

S. No	Activity	Type of Waste	Scope for possible reuse	Disposal of Waste
I	**CONSTRUCTION WASTES**			
	SiteClearance	Vegetativecover and top	Vegetating embankment slopes	
		Unsuitablematerial in	Embankment Fill	Low lying areas
2	Earthworks			
	Over burden of borrow	Vegetativecoverandsoil	Vegetatingembankmentslopes	
	Overburdenof quarries	Vgetativecoverandsoil	Vegetatingembankmentslopes	
		Granularmaterial	EmbankmentFill,Pitching	
	Accidentalspillages	Dust		
	Embankmentconstruction	SoilandGranularMaterial	EmbankmentFill	
	Constructionofearthen	Soil	EmbankmentFill	
3	Concrete structures			
	Storageofmaterials	Dust,Cement,Sand,	Constructingtemporarystructure,	
		MetalScrap		Scrap Yard
	Handlingofmaterials	Dust		
	ResidualWastes	Organicmatter	Manure,Revegetation	
		Cement,sand	Constructingtemporarystructure,	
		Metalscrap	Diversionsign,GuardRail	
4	Reconstructionworks			
	Dismantlingofexisting pavement	BitumenMix,granular	Sub-base	
		Concrete	Roadsub-base,reuseinconcrete,fill	
		Guardrailsignpost,guard	Reuseforsame	
	Dismantlingof cross drainagestructures	Granularmaterial&bricks	Constructingtemporarystructure,	
		Metalscrap	Diversionsign,GuardRail	
		Pipes	Culvert	
	Decommissioningofsites			
	Dismantlingottemporary	Granularmaterialandbricks	Constructingtemporarystructure,	
II	**OILAND FLUIDS**			
	Constructionmachinery	OilandGrease	Incineration,Cooking,Illumination	
2	Bituminousworks			
	Storage	Bitumen	Low GradeBitumen Mix	
	Mixingandhandling	Bitumen	LowGradeBitumen Mix	
		BitumenMix	Sub-base,Paving access&crossroads	
	Rejected bituminousmix	BitumenMix	Sub-base,Pavingaccess&crossroads	
III	**DOMESTICWASTES**			
	Constructioncamps	OrganicWaste,	Manure	
		Plasticandmetalscrap		ScrapYard
		Domesticeffluent		

Practices to avoid - Waste disposal
Tipping of Waste into stream channels, water location of disposal site as well as the bodies, forests and vegetated slopes Non-cleaning of Wastes after day's work Leaching of Wastes Littering in construction camps / sites Storing Wastes on private land

Format 3: Identification of Waste Disposal Site

(To be filled by Contractor)

1. **Name of Work……**
2. **Name of Nearest Human Settlement……**

Sr. No.	Criteria on which information for each site is to be collected	Site 1	Site 2	Site 3	Site 4
1.	Existing Land use				
2.	Area				
3.	Total material than can be dumped within the site (m^3)				
4.	Distance from Nearest Watercourse				
5.	Nearest Settlement (m)				
6.	Whether the community is agreeable to siting of dumping site (Y/N)				

Remarks:……

……

Submitted **Checked** **Approved**

Signature **……** **……** **……**
Name **……** **……**
Designation **……** **……**

Contractor **Operator** **Assistant Engineer PIU** **Executive Engineer, PIU**

8 ECoP 7.0: Water Bodies

Water bodies may be impacted when the intake construction is adjacent to it and laying of distribution line. The following activities are likely to have an adverse impact on the ecology of the area:

- Earth moving
- Removal of vegetation
- Vehicle/Machine operation and maintenance
- Waste disposal from construction camps

Project Planning and Design Stage/Start Up Phase

- All efforts are to be taken to avoid the alignments passing adjacent or close to water bodies. Where possible, it should be realigned away from the water body without cutting its, decreasing the storage area. Stream bank characteristics and hydrology of the area are to be studied before finalizing the alignment, the profile and cross-drainage structures.
- The decision on shifting the alignment or provision of erosion control measures on water bodies shall be taken by the Operator and to be approved by ULB/KUIDFC. However, it shall be ensured by the Operator that no adverse affect on the water body shall take place during construction stage.
- The Operator after an assessment of the likely impacts on the water body and review of the provisions of this ECoP shall include measures for rectifying the likely negative impact due to the construction.
- Besides the following measures, the rehabilitation plan should include activities which are required as per statutory provisions applicable in the state:
    - Locations of erosion protection works and silt fencing should be provided to prevent sediment laden runoff caused by construction activities, entering the water body.
    - Work program should be prepared in relation to the anticipated season of flooding/overflowing of the water body
    - Costs of rehabilitation.
- Concurrence of the community has to be sought on the Rehabilitation Plan and community concerns, if any have to be incorporated into the plan by the Operator.
- Cost estimates to mitigate impacts on water bodies through the rehabilitation plan or otherwise shall be incorporated into the DPR

Steps for addressing impacts on Water Bodies in DPR in case of new alignment.

Step 1: Capture following details:

- Location of pond in relation to existing pipe alignment.
- Approximate size and depth of the water body in meters ‘m’.
- Designated use of the water body – Household Use/Drinking/Irrigation.
- Visual inspection of the quality of water.

Step 2: Consult people regarding alternate routes that were devised to avoid the pond. If alternate routes are not available, consent of the communities is to be sought for affecting the pond and also the measures that would be taken to mitigate the impacts.

Step 3: If impacting the pond, the extent of impact is to be clearly indicated on a separate drawing showing blown up portion of the pond.

Step 4: Prepare rehabilitation plan if water body is getting adversely impacted.

Step 5: Precautionary measures while working close to the water body are to be incorporated into the Detailed Project Report.

Pre-construction stage/Start Up Phase

When there is interruption to regular activities of communities near water body due to construction or rehabilitation work, following are the Contractor's responsibilities:

- Restriction on use of water during construction, if any, should be intimated to the community in advance
- Alternate access to the water body is to be provided in case there is interruption to use of exiting access. The access provided should be convenient for use of all the existing users whether community or cattle
- If the water body affected is a drinking water source for a habitation, alternate sources of water are to be provided to the users during the period for which its use is affected

Construction Stage/Transition Phase

- It should be ensured by the contractor that the runoff from construction site does not enter into water body. In case it is unavoidable, it should be ensured that the run-off entering the water body is generally free from sediments.
- Silt/sediment should be collected and stockpiled for possible reuse as surfacing of slopes where they have to be re-vegetated.
- Movement of machinery and workforce shall be restricted around the water body, and no waste from construction camps or sites shall be disposed into it.

Post construction stage/ O & M Phase

- The precincts of the water body have to be left clean and tidy with the completion of construction.
- PIU/SPV will check if drainage channels of adequate capacity, have been provided for the impacted water body.

9 ECoP8.0: Water Quality Monitoring Plan

Water Quality Standards

The Bureau of Indian Standards specification IS: 10500-1991 governs the quality of drinking water supplies in India by public agencies. These are based on International standards for drinking water quality issued by the WHO and the manual of standards of quality for drinking water supplies, ICMR, 197.

During the Transition and O&M Phases, Operator is responsible to ensure that Water supplied to consumers conforms to the water quality standards. The Operator shall assess, plan and implement the water quality surveillance protocol as specified in the Schedule 1 (Operator's Obligations) of the Operator Contract.

The Operator shall follow the minimum sampling and testing requirements specified under clause 4.1.3 of the Standard Operating Procedures in Schedule 1 of the Operator Contract.

10 ECoP9.0: Construction Plants & Equipment Management Plan

During execution of the project, construction equipments, machinery and plants always have impact on the environment. The impact can be due to the emissions, dust, noise and oil spills that concern the safety and health of the workers, surrounding settlements and environment as a whole. The ECoP describes the activities during the project stages where pollution control measures are required.

AIR QUALITY MANAGEMENT		
Project Activity/ Impact Source	**Environmental Impacts**	**Mitigation Measures/ Management Guidelines**
Construction vehicular traffic	Air quality can be adversely affected by vehicle exhaust emissions and combustion of fuels.	The Contractor should • Fit vehicles with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition. • Operate the vehicles in a fuel efficient manner • Cover haul vehicles carrying dusty materials moving outside the construction site • Impose speed limits on all vehicle movement at the worksite to reduce dust emissions • Control the movement of construction traffic • Service all vehicles regularly to minimize emissions
Construction machinery	Air quality can be adversely affected by emissions from machinery and combustion of fuels.	The Contractor shall • Fit machinery with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition in accordance with the specifications defined by their manufacturers to maximize combustion efficiency and minimize the contaminant emissions. Proof or maintenance register shall be required by the equipment suppliers and contractors/subcontractors • Focus special attention on containing the emissions from generators • Machinery causing excess pollution (e.g. visible smoke) will be banned from construction sites • Service all equipment regularly to minimize emissions • Provide filtering systems, duct collectors or humidification or other techniques (as applicable) to the concrete batching and mixing plant to control the particle emissions in all its stages, including unloading, collection, aggregate handling, cement dumping, circulation of trucks and machinery inside the installations

Construction activities	Dust generation from construction sites, material stockpiles and access roads is a nuisance in the environment and can be a health hazard.	• Water the material stockpiles, access roads and bare soils on an as required basis to minimize the potential for environmental nuisance due to dust. Increase the watering frequency during periods of high risk (e.g. high winds). Stored materials such as gravel and sand shall be covered and confined to avoid their being wind-drifted • Minimize the extent and period of exposure of the bare surfaces • Reschedule earthwork activities or vegetation clearing activities, where practical, if necessary to avoid during periods of high wind and if visible dust is blowing off-site • Restore disturbed areas as soon as practicable by vegetation/grass-turfing • Store the cement in silos and minimize the emissions from silos by equipping them with filters. • Establish adequate locations for storage, mixing and loading of construction materials, in away that dust dispersion is prevented because of such operations

NOISE AND VIBRATION MANAGEMENT		
Project Activity / Impact Source	Environmental Impacts	**Mitigation Measures/ Management Guidelines**
Construction vehicular traffic	Noise quality will be deteriorated due to vehicular traffic	The Contractor shall • Maintain all vehicles in order to keep it in good working order in accordance with manufactures maintenance procedures • Make sure all drivers will comply with the traffic codes concerning maximum speed limit, driving hours, etc. • Organize the loading and unloading of trucks, and handling operations for the purpose of minimizing construction noise on the work site
Construction machinery	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	The Contractor shall • Appropriately site all noise generating activities to avoid noise pollution to local residents • Use the quietest available plant and equipment • Modify equipment to reduce noise (for example, noise control kits, lining of truck trays or pipe lines) • Maintain all equipment in order to keep it in good working order in accordance with manufactures maintenance procedures. Equipment suppliers and contractors shall present proof of maintenance register of their equipment.

		• Install acoustic enclosures around generators to reduce noise levels. • Fit high efficiency mufflers to appropriate construction equipment • Avoid the unnecessary use of alarms, horns and sirens
Construction activities	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	The Contractor shall • Notify adjacent landholders prior any typical noise events outside of daylight hours • Educate the operators of construction equipment on potential noise problems and the techniques to minimize noise emissions • Employ best available work practices on-site to minimize occupational noise levels • Install temporary noise control barriers where appropriate • Plan activities on site and deliveries to and from site to minimize impact • Monitor and analyze noise and vibration results and adjust construction practices as required. • Avoid undertaking the noisiest activities, where possible, when working at night near the residential areas

The role and responsibility has been defined for different activities (Pre, construction and post construction phase) as shown below:-

Table 7:

Sr. No.	Activity	Site Responsibility	Monitoring Responsibility
Project Planning and Design Stage/Start Up Phase			
1	Selection criteria for setting up a plant area and parking lot for equipments and vehicles shall be done as per siting criteria for construction camp.	Contractor and Operator	Arrangements will be verified by the EE of PIU/SPV or his appointed representative not below the rank of AEE to enable redressal of grievances at a later stage of the project.
Pre Construction Stage/ Start Up Phase			
1	• The Contractor must educate the workers to undertake safety precaution while working at the plant / site as well as around heavy equipments • The contractor shall report on safety and pollution control to	Contractor and Operator	• The EE of PIU/SPV or his appointed representative not below the rank of AEE must ensure that the Contractor shall submit a copy of the NOC and PUC Certificates before the start

Sr. No.	Activity	Site Responsibility	Monitoring Responsibility
	the PIU/SPV (**Use Format 6 & 7**). • The Contractor shall ensure all vehicles must possess Pollution Under Control (PUC) Certificate, which and shall be renewed regularly. • The Contractor must ensure that all machinery, equipments, and vehicles shall comply with the existing Central Pollution Control Board (CPCB) noise and emission norms (**Use Format 8**). • The Contractor shall design the service road with protection measures as black topping at vulnerable points as in low lying areas.		of work. • Monitoring of all activities by the EE or his appointed representative not below the rank of AEE (**Format 8**).
Construction Phase /Transition Phase			
1	• The Contractor shall undertake measures as per **this ECoP** to minimize –the dust generation, emissions, noise, oil spills, residual Waste and accidents at the plant site as well as during transportation of material to construction site. • A detailed of Machinery Operation should be provided (**Use Format 4**). • During site clearance, all cut and grubbed materials shall be kept at a secured location so that it does not raise any safety concerns. • During *excavation, water* sprinkling shall be done to *minimize* dust generation • Frequent water sprinkling shall be done on the haul roads to minimize dust generation. • In case of loose soils, compaction shall be done prior to water sprinkling. • Cautionary and informatory sign shall be provided at all locations specifying the type of operation in progress. • The construction Waste	Contractor and Operator	The EE or *his* appointed representative not below the rank of AEE shall carry out periodic inspections to ensure that all the pollution control systems are appropriately installed and comply with existing emission and noise norms.

Sr. No.	Activity	Site Responsibility	Monitoring Responsibility
	generated shall be disposed as per guidelines for "Waste Management Plan". • The equipments, which are required to move forward and backward, shall be equipped with alarm for backward movement. It shall be ensure that the workers shall remain away from the working areas at such times. • Safety measures during bitumen construction work - Ensure that bitumen storing, handling as well as mixing shall be done at hot-mix plant or designated areas to prevent contamination of soil and groundwater (**Use Format 5)**. - Skilled labour shall be used while hand placing the pre- mixed bitumen material. - The hand placing of pre-mixed bituminous material shall be done only in following circumstances: • For laying profile corrective courses of irregular shape and varying thickness • In confined spaces where it is impracticable for a paver to operate and • For filling potholes - Provide safety equipments i.e. gumboots and gloves to the workers while handling bitumen - While applying Tack Coat, spraying of bitumen shall be done in the wind direction. The labour shall wear jacket while spraying the bitumen - All the bituminous work shall be done as per IRC's Manual for Construction and Supervision of Bituminous Works.		
Post Construction Phase/O&M Phase			
1	– Ensure that all the haul roads are restored to their original state.	Contractor and Operator	– Inspected by the EE or his appointed representative not below the rank of AEE.

Sr. No.	Activity	Site Responsibility	Monitoring Responsibility
	– In case any inner village road is damaged while transporting the procured material; the contractor shall restore the road to its original condition – ensure that the decommissioning of plant shall be done in environmentally sound fashion and the area to brought to its original state.		– The same is to be submitted to the EE before final payment is claimed.

Table 8: Measures at Plant Site

Concern	Causes	Measures
Dust Generation	Vehicle Movement	• Water sprinkling • Fine Materials shall be Transported in Bags or Covered by Tarpaulin during Transportation • Tail board shall be properly closed and sealed
	Crushers	• Water Sprinkling
	Concrete-Mix Plant	• Educate the workers for following good practices while material handling
Emissions	Vehicles	• Regular maintenance as per manufacture's recommendation
Emission	Generators	• Exhaust vent of long length
Noise Noise	Heavy Load Vehicles	• Exhaust silencer, Regular maintenance as per manufacture schedule
	Crushers	• Siting as per the ECoP Construction Camp
	Generators	• Shall be kept in closed room and regular maintenance as per Good practice
Oil Spills	Storage and Handling	• Good Practice • ECoP Waste Management
Residual Waste	Dust Collector and Pits	• ECoP Waste Management
Concrete Waste	Concrete-Mix plant (If any)	• ECoP Waste Management
Bitumen and bitumen mix	Hot-mix Plant	• ECoP Waste Management
	Trajectory of Equipment	• Caution Sign, awareness among workers
Safety	Movable Parts of Equipment	• Caution Sign, awareness among workers
	Plant Area / Site	• Caution Sign, safety equipment
	Accidents / Health	• First Aid Box and Emergency Response Plan
	Break down of vehicles	• Arrangement for towing and bringing it to the workshop

Format 4: Details of Machinery Operation

(To be filled by the Contractor)

1. **Name of Work……**
2. **Name of Nearest Human Settlement……**
3. **Date of Submission……**

1. Details of Machinery Operation

1.1	Total machinery in operation (Nos.)	
1.2	Number of pavers	
1.3	Number of rollers	
1.4	Number of excavators	
1.5	Number of dumpers	
1.6	Number of vehicles in repair at each location	
1.7	Details of Waste disposal. (Whether Sold/ Disposed)	

Remarks:……

……

Submitted		**Checked**	**Approved**	
Signature	**……**	**……**		**……**
Name	**……**	**……**		
Designation	**……**		**……**	

Contractor	**Operator**	**Assistant Engineer PIU**	**Executive Engineer, PIU**

Format 5: Safety Check list

(To be filled by the Contractor)

1. **Name of Work……**
2. **Name of Nearest Human Settlement…….**
3. **Name of Contractor……**
4. **Name of Safety Officer (if any)**
5. **Date of Submission……**

1. Location 1, 2 ,3

– **Adequate at time of Inspection (Y/N)** – **Needs Improvement** – **Needs Immediate Attention**	**Location 1**			**Location 2**			**Remarks**
General	A	B	C	A	B	C	
Stacking of Material							
Lighting							
Fire Prevention							
Fire Fighting Appliance							
Dust Control							
Noise Control							
First Aid Equipment							
Washing Facility							
Latrine							
Safety Shoes							
Others							

Remarks:……

……

Submitted **Checked** **Approved**

Signature **……** **……** **……**
Name **……** **……**
Designation **……** **……**

Contractor **Operator** **Assistant Engineer** **Executive Engineer,**

PIU PIU

Format 6: Accident Report

(To be filled by the Contractor)

1. **Name of Work**.....
2. **Name of Nearest Human Settlement**.....
3. **Date of Submission**.....

1. Type of Accident

1.1	Struck by moving objects	
1.2	Handling without machinery	
1.3	Crushing / burying	
1.4	Fire	
1.5	Contact with poisonous gas or toxic substances	
1.6	Vehicle / Mobile plant accident	
1.7	Machinery operation accident	
1.8	Any Other	

2. Agent Involved in Accident

2.1	Machinery	
2.2	Vehicle or associated equipment Machinery	
2.3	Material being handled, used or stored	
2.4	Gas, vapour, dust, fume or oxygen	
2.5	Hand tools	
2.6	Excavation / underground working	
2.7	Construction formwork, shuttering and falsework	
2.8	Any Other	

Part-II - To be completed Upon Finalization of Employee's Compensation Claim

- No permanentincapacity (Yes/No)
- Less than 5% incapacity
- More than 5% incapacity
- Fatal

Remarks:.....

.....

Submitted **Checked** **Approved**

Signature ....
Name ....
Designation ....

Contractor **Operator** **Assistant Engineer PIU** **Executive Engineer, PIU**

Format 7: Pollution Monitoring

1. **Name of Work……**
2. **Name of Nearest Human Settlement……**
3. **Monitoring measures suggested in last report compiled or not (if not give reason)……**

Sr. No	Changing (km)	Detail of Location	Duration of Monitoring	Instruments used	Completion			Results	Reason for exceeding results	Mitigation measures	Type of Area (Residential/ Commercial/Industrial	Remarks
1.	**Air Quality Monitoring**											
								PM_{10} **$PM_{2.5}$** **Sox** **NOx** **Others**				
2.	**Water Quality Monitoring**											
								pH, TSS, TDS, Turbidity, Hardness, BOD, Iron, Fluoride, Nitrate,				
3.	**Soil Quality Monitoring**											
								pH, Organic Carbon, Alkanity, P_2O_5, Conductivity, Iron,				

Sr. No	Changing (km)	Detail of Location	Duration of Monitoring	Instruments used	Completion			Results	Reason for exceeding results	Mitigation measures	Type of Area (Residential/ Commercial/Industrial	Remarks
								Pesticide, Nitrate				
4.	**Noise Monitoring**											
								L-day equivalent, L-night equivalent				

Remarks:……

Submitted **Checked** **Approved**

Signature …… …… ……
Name …… ……
Designation …… ……

Contractor **Operator** **Assistant Executive Engineer PIU** **Executive Engineer, PIU**

Format 8: Checklist for Environment Inspection

(Points / Issues to be covered)

1. **Name of Work**.....
2. **Name of Nearest Human Settlement**.....
3. **Date of Submission**.....

Sr. No.	ESMP Measures
1.	Provision of a personnel accountable for implementation of ESMP / Safety Measures with Contractor
2	Consent of KSPCB to Establish HMP (If applicable)
3	Consent of KS PCB to operate HMP (If applicable)
4	Compliance of KSPCB Conditions for HMP installation and operation
5	Whether compliance reported through monthly Progress report to Divisional Office of Executive Engineer
6	Precautions to prevent contamination of soil by emulsion, Bitumen, oil and lubricant taken while storing
7.	Providing cover to fine construction material & bituminous mix during transportation
8	Spoil and debris disposal
9	Safety equipment i.e helmet. gloves, gumboot, mask, earplugs etc. provided to workers
10	Provision of labour camp with sanitation & potable water
11	Fire precautions at Hot Mix Plant and site Office
12	Air and noise monitoring done in camp site
13	Status of drainage provision in camp area
14	Others

Remarks:.....

Submitted **Checked** **Approved**

Signature ....
Name ....
Designation ....

Contractor **Operator** **Assistant Executive Engineer PIU** **Executive Engineer, PIU**

11 ECoP 10.0: Public and Worker's Health & Safety

The safety and health concerns of the workers and the general public are impacted due to the hazards created during the construction of road. The detailed Health and Safety ECoP describes the hazards and measures that need to be taken to mitigate the impacts and is shown below.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Best practices	Construction works may pose health and safety risks to the construction workers and site visitors leading to severe injuries and deaths. The population in the proximity of the construction site and the construction workers will be exposed to a number of (i) biophysical health risk factors,(e.g. noise, dust, chemicals, construction material, solid waste, waste water, vector transmitted diseases etc.), (and (ii) road accidents from construction traffic.	The Contractor shall • Implement suitable safety standards for all workers and site visitors which should not be less than those laid down on the international standards (e.g. International Labour Office guideline on ‗Safety and Health in Construction; World Bank Group‘s ‗Environmental Health and Safety Guidelines‘) and contractor‘s own national standards or statutory regulations, in addition to complying with the standards of the Government of India and Government of Karnataka. • Provide the workers with a safe and healthy work environment, taking into account inherent risks in its particular construction activity and specific classes of hazards in the work areas, • Provide personal protective equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with the damaged ones. • Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job. • Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas/dense traffic zones; • Secure all installations from unauthorized intrusion and accident risks; • Appoint an environment, health and safety manager to look after the health and safety of the workers

Accidents	Lack of first aid facilities and health care facilities in the immediate vicinity will aggravate the health conditions of the victims	• Provide health care facilities and first aid facilities are readily available. Appropriately equipped first-aid stations should be easily accessible throughout the place of work. • Provide medical insurance coverage for workers • Document and report occupational accidents, diseases, and incidents. • Prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice. • Identify potential hazards to workers, particularly those that may be life-threatening and provide necessary preventive and protective measures. • Provide awareness to the construction drivers to strictly follow the driving rules • Provide adequate lighting in the construction area and along the roads
Water and sanitation facilities at the construction sites	Lack of Water sanitation facilities at construction sites cause inconvenience to the construction workers and affect their personal hygiene.	• The contractor should provide portable toilets at the construction sites, if about 25 people are working the whole day for a month. Location of portable facilities should be at least 6m away from storm drain system and surface waters. These portable toilets should be cleaned once a day and all the sewerage should be pumped from the collection tank once a day and should be brought to the common septic tank for further treatment. • Contractor should provide bottled drinking water facilities to the construction workers at all the construction sites.

Table 9:

Sr. No.	Activity	Site Responsibility	Monitoring Responsibility
ProjectPlanningandDesign Stage/ Start Up Phase			

Sr. No.	Activity	Site Responsibility	Monitoring Responsibility
1	To address health and safety concerns, the DPR shall contain selection criteria for setting up: – Construction	Contractor and Operator	Executive Engineer of PIU/SPV
2	To address the safety concerns to road user during operational phase, the DPR shall contain the following: – Selection and location of regulatory as well as informatory signs as per IRC: 67-2001, depending upon the geometry of the road. – Provision of passing places and parapet wall shall be included in road design		Monitoring of all activities by the EE of PIU/SPV or his appointed representative not below the rank of AEE.
Pre Construction Stage /Start Up Phase			
1	In order to incorporate public health and safety concerns, Contractor shall disseminate the following information to the community: • Location of construction camps, borrow areas and new quarry areas. • Extent of work • Time of construction • Diversions, if any • Precaution measures in sensitive areas • Involvement of local labours in the road construction • Health issues- water stagnation, exposure to dust, communicable disease • Mechanism for grievances	Contractor and Operator	Monitoring of all activities by the EE of PIU/SPV or his appointed representative not below the rank of AEE.
2	The Contractor must educate the workers to undertake the health and safety precautions. The contractor shall educate the workers regarding: – Personal safety measures and location of safety devices. – Interaction with the host community – Protection of environment with respect to: 1. Trampling of vegetation and cutting of trees for cooking 2. Restriction of activities in forest areas and also on hunting 3. Water bodies protection 4. Storage and handling of materials 5. Disposal of construction Waste	Contractor and Operator	Monitoring of all activities by the EE of PIU/SPV or his appointed representative not below the rank of AEE.
Construction Phase /Transition Phase			

Sr. No.	Activity	Site Responsibility	Monitoring Responsibility
1	During the progress of work, following are the safety requirements that need to be undertaken by the contractor at the construction site: - Personal safety equipments (such as footwear and gloves) for the workers - All measures as per bidding document shall be strictly followed - Additional provisions need to be undertaken for safety at site: o Adequate lighting arrangement o Adequate drainage system to avoid any stagnation of water o Lined surface with slope 1:40(V:H) and provision of lined pit at the bottom, at the storage and handling area of bitumen and oil, as well as at the location of generator (grease trap). o Facilities for administering first aid	Contractor and Operator	The EE or *his* appointed representative not below the rank of AEE shall carry out periodic inspections to ensure that all the pollution control systems are appropriately installed and comply with existing emission and noise norms.
2	The following measures need to be adopted by the contractor to address public safety concerns: – The Contractor shall schedule the construction activities taking into consideration factors such as: 1. Sowing of crops 2. Harvesting 3. Local hindrances such as festivals etc 4. Availability of labour during particular periods – All the cautionary signs as per IRC: 67-2001 and traffic control devices (such as barricades, etc) shall be placed as soon as construction activity get started and shall remaining place till the activities get completed. – Following case specific measures need to be followed during the progress of the activity: 1. In case of blasting, the Contractor must follow The Explosives Rules, 1983.	Contractor and Operator	
Post Construction Phase/ O & M Phase			

Sr. No.	Activity	Site Responsibility	Monitoring Responsibility
1	During this stage a major concern is on road user *safety.* Following are the measures that need to be undertaken by the Operator to ensure safer roads: – Inspection and maintenance of installed regulatory and informatory signs – Ensure that the location of signage does not obstruct the visibility – In case of hill roads, maintenance of parapet wall as well as of overtaking zone	Operator	The EE or his appointed representative not below the rank of AEE must ensure that during the maintenance operation of road, road materials are stored at a location such that they shall not create any risk to road users. The construction site shall be cleaned of all debris, scrap materials and machinery on completion of construction for the safety of public and road users.

Table 10: Environmental Health and Safety Management Plan

S. No.		Activity	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility	Quality Responsibility
1.	Occupational Health and Safety (OHS)	– Fire Fighting – Adequate Water Supply – Medical Facility – Road Access	– Fire Hazards – Health Problems – Stress on workers – Accident/Casualty	– Fire suppression and control such as Manual portable extinguishers and precautionary measures. – Siren/Alarm system should be installed – Provision of Potable Water Supply at site – Provision of Clean Eating Area – Provision of Lighting – Provision of Safe Access – Provision of First Aid Box	Contractor and Operator	Executive Engineer of PIU/SPV	Third Party / ULB
		– Communication & Training		– Provisions should be made to provide OHS orientation training to all new employees to ensure they are apprised of the basic site rules of work at / on the site and of personal protection and preventing injury to fellow employees. – Training should consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation and natural disaster – Any site-specific hazard or color coding in use should be thoroughly reviewed as part of orientation training	Contractor and Operator	Executive Engineer of PIU/SPV	Third Party / ULB
		– Rotating & Moving Equipment – Heavy Machinery Handling and Haulage of Machinery - Material Handling & Storage - Transport of Materials – Debris Disposal	– Vibration - Air/Noise Pollution - Water Pollution - Soil Pollution - Workers and local people exposure - Impact on Human health – Water Delivery Reduction Interruption	– Designing machines to eliminate trap hazards and ensuring that extremities are kept out of harm's way under normal operating conditions – Turning off, disconnecting, isolating, and de-energizing machinery – Provide safety measures (mask, gloves, hat etc) – Organize health camps – Follow proper operation and handling measures to minimize exposure – Head phones, ear plugs to be provided to the workers at construction site.	Contractor and Operator	Executive Engineer of PIU/SPV	Third Party / ULB

S. No.		Activity	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility	Quality Responsibility
		– Labor Camp	– Workers and local people exposure – Impact on Human health	- Provide safety measures (mask, gloves, hat etc) to minimize exposure - Provide sirens in vehicles to avoid any collision with human/animals - Organise awareness programs on environmental resource management - Organise Health camps - Child labour must be strictly prohibited - Provide signages near work sites - Locate handling sites away from populated areas - Follow proper operation and handling measures to minimize exposure - Routine medical check up of Field staff and labours - Provision of potable drinking water at site - Provision of proper sewage and Waste disposal system. Sanitation facilities have to be provided at the camp sites.. - First aid facilities to be provided at the construction camps. Any case of disease outbreak may be immediately subjected to medical treatment. Mosquito repellant to be provided to the labors such as odomas, coil and sprays. The camps may maintain cleanliness and hygienic condition. - Head phones, ear plugs to be provided to the workers at construction site. - All workers employed on mixing of asphaltic material, cement, lime mortars, concrete etc. may be provided with protective footwear and protective goggles. Workers involved in welding work may be provided with welder's protective eye shields - Adequate precaution must be taken to prevent danger from electrical equipments	Contractor and Operator	Executive Engineer of PIU/SPV	Third Party / ULB

S. No.		Activity	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility	Quality Responsibility
2.	Community Health and Safety	- Water Quality & Availability	- Health Problem - Stress on workers	- Drinking water sources should be protected from air emissions, Wastewater effluents, oil and hazardous materials, and Wastes. - Drinking water sources, whether public or private, should provide potable water at all times - Drinking water quality provided should meet National Drinking Water Standards (IS:10500)	Contractor and Operator	Executive Engineer of PIU/SPV	Third Party / ULB
		– Waste water & Sanitation	– Unhygienic Condition – Health Problems – Air Pollution – Water Pollution – Soil Pollution	- Provide mobile toilet at site - Consider provision of systematic, regular collection of fecal sludge - Use appropriate collection vehicles - Wastewater and fecal sludge should not be disposed off in or near any water bodies -	Contractor and Operator	Executive Engineer of PIU/SPV	Third Party / ULB
		– Solid Waste/Hazardous Waste	– Health Problems – Air Pollution – Water Pollution – Soil Pollution	– Dump solid Waste in specified place to minimize contamination of water – Discharge Wastewater at authorized locations and after treatment – Proper labeling of containers, including the identify and quantity of the contents, hazards, and shipper contact information – Implement a training program for workers – Continuously monitor air quality in work areas for hazardous conditions – Hazardous/solid Waste should be managed as per Municipal Solid Waste Management Rules -2000, and Hazardous Waste – Providing the necessary means for emergency response on call 24 hours/day	Contractor and Operator	Executive Engineer of PIU/SPV	Third Party / ULB

S. No.		Activity	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility	Quality Responsibility
		– Diseases Prevention	– Communicable Diseases – Vector-Borne Diseases	– Providing surveillance and active screening and treatment of workers – Preventing illness among workers in local communities by: **1.** Undertaking health awareness and education initiatives **2.** Training health workers in disease treatment **3.** Conducting immunization programs for workers in local communities to improve health and guard against infection – Elimination of unusable impounded water – Increase in water velocity in natural and artificial channels – Promoting use of repellents, clothing, netting, and other barriers to prevent insect bites – Monitoring communities during high-risk seasons to detect and treat cases	Contractor and Operator	Executive Engineer of PIU/SPV	Third Party / ULB
		– Structural safety of project infrastructure	– Physical trauma associated with failure of building structures – Burns and smoke inhalation from fires – Injuries suffered as a consequence of falls or contact with heavy equipment – Respiratory distress from dust, fumes, or noxious odors – Exposure to hazardous materials	– The following issues should be considered and incorporated as appropriate into the planning, siting, and design phases of the project: – Inclusion of buffer strips or other methods of physical separation around project sites – Incorporation of siting and safety engineering criteria to prevent failures due to natural risks posed by earthquakes, wind, flooding, landslides and fire – Application of locally regulated or internationally recognized building codes – Engineers and architects responsible for designing and constructing facilities, treatment plants, service reservoirs plants and other structures should certify the applicability and appropriateness of the structural criteria employed	Contractor and Operator	Executive Engineer of PIU/SPV	Third Party / ULB

S. No.		Activity	Impacts	Mitigation Measures	Site Responsibility	Supervision Responsibility	Quality Responsibility
		– Life and fire safety for new buildings or rehabilitated buildings accessible to the public	– Injuries	– Project sponsors' architects and professional consulting engineers should demonstrate that affected buildings meet the life and fire safety objectives – Life and fire safety systems and equipment should be designed and installed using appropriate prescriptive standards and/or performance based design, and sound engineering practices – Life and fire safety design criteria for all buildings should incorporate all local building codes and fire department regulations	Contractor and Operator	Executive Engineer of PIU/SPV	Third Party / ULB
3.	Traffic Management	– Vehicle Movement	– Health Problems – Injuries – Air Pollution – Water Pollution – Soil Pollution	– Emphasizing safety aspects among drivers – Improving driving skills and requiring licensing of drivers – Adopting limits for trip duration and arranging driver rosters to avoid overtiredness – Avoiding dangerous routes and times of day to reduce the risk of accidents – Providing the necessary means for emergency response on call 24 hours/day – Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure – Where the project may contribute to a significant increase in traffic along existing roads: collaboration with local communities to improve signage, visibility and overall safety of roads, employing safe traffic control measures such as road signs and flag persons	Contractor and Operator	Executive Engineer of PIU/SPV	Third Party / ULB

Format 9: Safety Check list

(To be filled by the Contractor)

6. **Name of Work**……
7. **Name of Nearest Human Settlement**……
8. **Name of Contractor**……
9. **Name of Safety Officer (if any)**
10. **Date of Submission**……

1. **Location 1, 2 ,3**

– **Adequate at time of Inspection (Y/N)** – **Needs Improvement** – **Needs Immediate Attention**	**Location 1**			**Location 2**			**Remarks**
General	A	B	C	A	B	C	
Stacking of Material							
Lighting							
Fire Prevention							
Fire Fighting Appliance							
Dust Control							
Noise Control							
First Aid Equipment							
Washing Facility							
Latrine							
Safety Shoes							
others							

Remarks:……

……

Submitted **Checked** **Approved**

Signature …… …… ……
Name …… ……
Designation …… ……

Contractor **Operator** **Assistant Executive Engineer PIU** **Executive Engineer, PIU**

12 ECoP 11.0: Road, Transport and Road Traffic Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Increased traffic use of road by construction vehicles will affect the movement of normal road traffics and the safety of the road users.	The Contractor shall • Prepare and submit a traffic management plan to the Operator with a copy to PIU/SPV for approval at least 30 days before commencing work on any project component involved in traffic diversion and management. • Include in the traffic management plan to ensure uninterrupted traffic movement during construction: detailed drawings of traffic arrangements showing all detours, temporary road, temporary bridges temporary diversions, necessary barricades, warning signs /lights, reflective flags, road signs etc. • Provide signs at strategic locations of the roads complying with the schedules of signs contained in the IRC. 67: 2012 and as per Guidelines on Design and Installation of Road Traffic Signals (IRC 93) • **Warning/Caution Boards** to be erected at each of the 2 prior intersections / at 500m and 1 km on roads leading to the work site. • Install and maintain a display board at each important road intersection on the roads to be used during construction, which shall clearly show the following information in Kannada/English: - Location: Road and Ward - Duration of construction period

		- Period of proposed detour / alternative route - Suggested detour route map - Name and contact address/telephone number of the concerned personnel - Name and contact address / telephone number of the Contractor - Inconvenience is sincerely regretted.
	Accidents and spillage of fuels and chemicals	Restrict truck deliveries, where practicable, to day time working hours. • Restrict the transport of oversize loads. • Operate road traffics/ transport vehicles, if possible, to non-peak periods to minimize traffic disruptions. • Enforce on-site speed limit

13 ECoP 12.0: Cultural Properties Plan

Cultural properties can be located close to the service area and might be impacted by construction activities. Most of the properties are avoided in general during implementation of interventions.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities near religious and cultural sites	Disturbance from construction works to the cultural and religious sites, and contractors lack of knowledge on cultural issues cause social disturbances.	The Contractor shall • Communicate to the public through community consultation and newspaper announcements regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restriction. • Do not block access to cultural and religious sites, wherever possible • Restrict all construction activities within the foot prints of the construction sites. • Stop construction works that produce noise (particularly during prayer time) should there be any religious/educational institutions close to the construction sites and users make objections. • Take special care and use appropriate equipment when working next to a cultural/religious institution. • Show appropriate behavior with all construction workers especially women and elderly people • Resolve cultural issues in consultation with local leaders and supervision consultants • Establish a mechanism that allows local people to raise grievances arising from the construction process.

The role and responsibility has been defined for different activities (Pre, construction and post construction phase) which are given below:-

Table 11:

Sr. No.	Activity	Site Responsibility	Monitoring Responsibility
ProjectPlanningandDesign Stage/Start Up Phase			
1	Measures for mitigation of impacts on cultural properties during project preparation shall be as per the following steps: – Identification of locally significant cultural properties should be done – Assessment of likely impacts on each cultural property due to project implementation – The extent of impact on the identified culture property should be assessed and possible measures for avoidance should be devised based on the site investigation	Operator	Monitoring of all activities by the EE of PIU/SPV or his appointed representative not below the rank of AEE.
2	– Incase impact is not avoidable, identification of alternative routes or possibility of relocation of the culture property shall be assessed only in unavoidable cases following due procedure and with the approval of concerned authorities. . – A detailed design of the relocated structure and its site plan along with the necessary BOQ are to be presented in DPR. The relocation and other avoidance measures should be carried out before the start of the road work.		– Monitoring of all activities by the EE of PIU/SPV or his appointed representative not below the rank of AEE. – It must be ensured by the EE of PIU/SPV or his appointed representative not below the rank of AEE that the BOQ and rates are incorporated into the contract document.
Construction /Transition Phase			
1	Following are precautionary measures that need to be undertaken by the contractor while working near these structures: – Provision of temporary barricades to isolate the precincts of the cultural property from the construction site shall be devised by the Engineer to avoid impacts. – Restrict movement of heavy machinery near the structure – Avoid disposal or tipping of earth near the structure – Access to these properties shall be kept clear from dirt and grit	Contractor and Operator	The EE or *his* appointed representative not below the rank of AEE shall carry out periodic inspections to ensure that all the pollution control systems are appropriately installed and comply with existing emission and noise norms.

Sr. No.	Activity	Site Responsibility	Monitoring Responsibility
2	Information to be collected:- – Location – Direction(North/South/East/West) With Respect to Road – Distance of the structure from existing center line of the road – Type of Property eg: temple/mosque/shrine/dargah etc – Plan of the structure – Importance of the structure historical/social/archeological – Ownership of the property – Probable loss to the property – Specific periods/durations in which large congregations as festivals/mela take place causing hindrance to vehicular movement – Choice of community, issue of relocation	Contractor and Operator	
3	– During earth excavation, if any propertyis unearthed and seems to be culturally significant or likely to have archeological significance, the same shall be intimated to the Executive Engineer of PIU/SPV immediately (**Use Format 10**) – The State Archeological Department shall be intimated of the chance find and the Engineer shall carry out a joint inspection with the department. Actions as appropriate shall be intimated to the Contractor along with the probable date for resuming the work	Contractor and Operator	
Post Construction/O & M Phase			
1	– Immediately after completion of construction, the Contractor will affect clearance of the precincts of cultural properties. – Incase access to any of the cultural properties is severed during construction; it needs to be restored at the Contractor's cost.	Operator	The EE or his appointed representative not below the rank of AEE shall certify restoration of all road links as well as relocated properties before final payment is made

14 ECoP 13.0: Environmental Monitoring and Audit

Environmental Monitoring provides a systematic review of planning, designing, construction practice and operation activities that may have adverse impact on the surrounding environment. Environmental monitoring enables identification of:

- Degradation/improvement of surrounding ecology
- Damage to surrounding habitation and
- Extent of compliance with ECoPs and other regulatory provisions

PIU/SPV should assess whether construction activities comply with environmental standards and other regulatory requirements, by monitoring and conducting an Environmental Audit. These need to be carried out on a periodic basis.

Aspects for Audit...

- Site preparation
- Material management
- Water management and economy of use
- Waste generation, management and disposal
- Siting construction camps, plants and equipments

Monitoring Procedure

PIU/Technical Auditor shall be responsible for conduct of the periodical environmental monitoring. It will be conducted in phases corresponding to the phases of the project such as (i) Start–Up Phase (ii) Transition Phase and (iii) Operation & Maintenance Phase. Concurrent audit can be undertaken along with quality assurance checks that need to be conducted by the Technical Auditor.

Benefits of Audit...

- Determines the efficiency of practices followed during execution of the work
- Determines the performance of environmental measures suggested
- Assesses the need to undertake additional measures to minimize any adverse environmental impacts identified during the project period
- Audit develops the potential of waste minimization and adoption of recycling and reuse of waste.

Environmental audit shall be as per the Checklist 1 & 2 provided in the end. Quarterly audit for project preparation, pre-construction and post-construction shall be undertaken by EE. While for transition phase audit shall be carried out by Technical Auditor appointed by KUIDFC. The audit findings shall be reported to the nodal officer on quarterly basis for all the phases.

Checklist-1: Audit Checklist for DPR preparation

S. No.	Items for Inclusion in DPR	Response				Attachments
		Yes	No	NA	Indicate Number	
I						
1						
II	**Initial Consultation**					
1	Are consultations conducted with community before new alignment finalization					Suggestions received from Community

S. No.	Items for Inclusion in DPR	Response				Attachments
1.1	Suggestions received on the proposed alignment					Write up on suggestions received and response of EE or his appointed officer not below the rank of AE
2.	Are suggestions received from community been incorporated into design					
2.1	Only few suggestions are incorporated					Reasons for not incorporating suggestions from community
2.2	Are reasons for not incorporating suggestions been communicated to the community					
III	**Identification of PAPs (if any)**					These shall be as per R & R Policy
IV	**R&R actions (if any)**					These shall be as per R & R Policy
V	**Environmental Concerns**					
1.	Environmental clearances to be obtained, if required					Copy of Clearance obtained
1.1	SPCB					Copy of application from submitted if clearance is pending
1.2	Forest Department					
1.3	MoEF					
VI	**Surveys Conducted**					
1.	Are detailed surveys conducted for the project					Information presented in DPR
1.1	Geological Studies					
1.2	Topographical survey					
1.3	Hydrological Studies					
1.4	Customer Survey					
VII	**Loss of common property resources**					
1.	Are provisions made to community losing common property of assets, if any					Type of loss and arrangements made
1.1	Are provisions for relocation of cultural properties been made					
VIII	**Material source identification, extraction and rehabilitation**					
1.	Are provisions made in specifications for identification of borrow areas to reduce cost and use waste materials					
2	Are provisions made for rehabilitation of borrow areas in the DPR/ Specifications					
3	Were sources of alternate materials explored or provisions made for utilizing them, to reduce cost and waste materials					Properties of alternative material and extent utilization
4	If answer to No. 17 is no, then are arrangements made for identification, extraction, rehabilitation of canal or dam as per EMP					
5	Is project area water scarce?					
5.1	If answer to number 5 is yes, are possibilities of use existing water sources identified in consultation with community or Govt. Departments? (Community water sources to be used only with their consent)					List of existing perennial sources prepared

S. No.	Items for Inclusion in DPR	Response				Attachments
5.2	Are provisions in the specifications made for identification, procurement and rehabilitation arrangements to be carried out by the contractor					
IX	**Water Bodies**					
1	Does the alignment cut across or passing adjacent to water body?					
1.1	Are consultation conducted with community for seeking consent and measures to be taken to mitigated impacts					
1.2	Are detailed designs prepared indicating other water bodies (Pond, Wetland, etc.) to be affected					Detailed blown up drawing indicating the water bodies
1.3	Are provisions made for control of pollution of water during construction					
X	**Slope Stability, Soil Erosion & Top soil conservation**					
1	Is stability analysis carried out ?					Information to be included in DPR
2	Are slope stabilization measures included in the DPR					Locations of measures where required **along** with the measures suggested
3	Are erosion control measures included in the DPR					Locations of measures required and measures suggested
4	Are species of vegetation to be grown over the steep slopes determined					List of species along with the growth & root characteristics, water requirements
5	Are provisions made for conservation of topsoil					
5.1	Is reuse of topsoil been included in the special conditions of contract					
XII	**Forests & Tree Plantation**					
1	Are trees being cut by the project, if yes indicate number of trees felled					
1.1	Is clearance from the forest department obtained					
1.2	Is land identified for compensatory plantation					
1.3	Is roadside plantation being taken up? If yes indicate number of trees being planted					
2	Is any forest land being diverted for the project					
2.1	Are provisions made in the specifications to avoid setting up of construction camps/borrow areas and quarry areas in the forest areas?					
XIII	**Natural Habitat**					
1	Does any natural habitat as per data exists along the project area (if any)					
1.1	Is inventorization of ecological features being done					
1.2	Are provision for road design made as per EMP					

S. No.	Items for Inclusion in DPR	Response				Attachments
XIV	**Pollution Prevention measures**					
1	Are provisions made for administering pollution control measures at construction sites as per ESMP					
2	Are provisions made for safe disposal of wastes from construction sites					Location of disposal sites and arrangements made for safe disposal
XV	**Safety**					
1	Are provisions made for worker's health & hygiene at construction camp					Layout of construction camp with arrangements for health & hygiene of workers
2	Are provisions made for traffic diversions -during construction					
2.1	Are provisions made for signage, demarcating cones and tapes during construction on tracks being utilized by traffic at present					
3	Are provisions made for supply of Personal Protective Equipment to the workers					Reference to the bill of quantities
XVI	**Finalization of Alignments -**					
1	Are designs conforming to CPHEEO manual, if no then are the criteria adopted.					
XVII	**Monitoring**					
1	Are provisions made for supervision of implementation of the environmental measures as per plan					
2	Are steps provided for inspection of the bridges and culverts					

15 ECoP 13.0: Consultations for Environmental Aspects

All stages of project planning, preparation and implementation will involve interaction with the community. Consultations with community or other stakeholders are an integral part of the project activities. These would in general be conducted by the PIU/SPV in prioritization and project preparation and post construction stages. This ECoP is intended to provide guidelines for the PIU/Contractor for conducting the consultations.

Start Up Phase

The feasibility report for the projext shall be displayed at ULB.

During the start up phase, information on the connectivity and other provisions of ESMP shall be disseminated at the Community level of the concerned ULB.
To enable incorporation of environmental and social concerns into the project preparation, an inventory of environmental and social features of the alignment needs to be prepared during topographical survey.

Consultations during this stage will be towards seeking consent of landowners for clearance of the land width, temporary use of land and material provision for construction.

Consultations to be conducted ...
- Information dissemination about proposed core network

During Project Preparation for ....
- Dissemination of project information
- For finalizing alignment
- For disseminating information on incorporation/non-incorporation of environmental concerns into project design

During Implementation for...
- Seeking consent on temporary use of land for setting up construction facilities, borrowing, traffic diversions and disposal of wastes
- Seeking consent on extraction of water for construction, relocation of common property resources and cultural properties

The consultations to be conducted during this stage and aspects to be covered are presented in the individual ECoP prepared for each aspect. Operator along with PIU/SPV will be conducting the consultations towards clearance of the proposed alignment with land owners while Contractor will be conducting consultations for temporary use of land and for material provision for construction. Table 15 summarizes the consultations to be conducted and provisions made in the individual ECoPs along with the responsibilities.

Table 12: Consultations during Start Up Phase

Sr. No.	Aspects of Consultation	Desired Outputs	Reference
1.	**Consultations for Clearance of Road land width**		
1.1	Consultation for Relocation of Common Property Resources (CPR) , if any	• Consent for relocation of CPR • Identify area for relocation	ECoP-2.0

Sr. No.	Aspects of Consultation	Desired Outputs	Reference
1.2	Relocation of Cultural Properties	• Consent for relocation of cultural property • Discussion on design for relocated structures • Identify area for relocation	ECoP-12.0
2	**Consultations for Temporary use of Land**		
2.1	Setting up Construction Camp	• Consent for setting up the camp • Terms of use as: free of cost, payment of rent for use or any other • Rehabilitation options for the land subsequent to its use	ECoP-3.0
2.2	Disposal of Wastes	• Consent for use of land for waste disposal • Type of wastes to be disposed • Rehabilitation of land subsequent to waste disposal	ECoP-6.0
2.3	Diversion of Traffic	• Consent for use of land for temporary traffic diversion • Site preparation as removal of topsoil along the route for temporary diversion • Rehabilitation of land subsequent to completion of construction in the stretch	ECoP-10.0 and 11.0
3.	**Consultations for material extraction**		
3.1	Extraction of water	• Seeking consent on extraction of water • Terms of use as: free of cost or payment for water used	ECoP-5.0

Construction Stage/Transition Phase

The Site Engineer in charge of the project shall settle any grievances raised by the community during this stage. If grievances remain unaddressed, they shall be referred to the concerned senior officers of PIU (Assistant Executive Engineer and Executive Engineer) and shall be addressed as per the Grievance Redressal Mechanism devised in the Resettlement Framework.

Post-Construction/O & M Phase

The PIU shall conduct consultation with the community on leakages of distribution line, water quality and illegal connections. Awareness on impacts likely due to above said problems will be generated during the consultations. Measures to be undertaken for its control and avoid encroachments shall be discussed and necessary arrangements shall be notified.

Consultation Schedule Consultations to be conducted at various stages of the project and agencies responsible shall be as per the schedule given in Table 16

16 ECoP 14.0: Soil Management

SOIL QUALITY MANAGEMENT		
Project Activity / Impact Source	**Environmental Impacts**	**Mitigation Measures/ Management Guidelines**
Storage of hazardous and toxic chemicals	Spillage of hazardous and toxic chemicals will contaminate the soils	The Contractor shall • Strictly manage the wastes management plans proposed in ECoP 6.0 and storage of materials in ECoP3.0 • Construct appropriate spill contaminant facilities for all fuel storage areas • Establish and maintain a hazardous materials register detailing the location and quantities of hazardous substances including the storage, use of disposals • Train personnel and implement safe work practices for minimizing the risk of spillage • Identify the cause of contamination, if it is reported, and contain the area of contamination. The impact may be contained by isolating the source or implementing controls around the affected site • Remediate the contaminated land using the most appropriate available method to achieve required commercial/industrial guideline validation results
Construction material stock piles	Erosion from construction material stockpiles may contaminate the soils	The Contractor shall • Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds

TOP SOIL MANGEMENT

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Land clearing and earth works	Earthworks will impact the fertile top soils that are enriched with nutrients required for plant growth or agricultural development.	The Contractor shall • Strip the top soil to a depth of 15 cm and store in stock piles of height not exceeding 2m. • Remove unwanted materials from top soil like grass, roots of trees and similar others. • The stockpiles will be done in slopes of 2:1 to reduce surface runoff and enhance percolation through the mass of stored soil. • Locate topsoil stockpiles in areas outside drainage lines and protect from erosion. • Construct diversion channels and silt fences around the topsoil stockpiles to prevent erosion and loss of topsoil. • Spread the topsoil to maintain the physico-chemical and biological activity of the soil. The stored top soil will be utilized for covering all disturbed area and along the proposed plantation sites • Prior to the re-spreading of topsoil, the ground surface will be ripped to assist the bonding of the soil layers, water penetration and re-vegetation - Return stockpiled topsoil to the borrow pit and all worked areas to be stabilized through re-vegetation using local plants. • Control at each site by ensuring that base of the borrow pit drains into a sediment trap prior to discharging from the site.
Development and operation of borrow areas	Generally excavated materials will be used as borrow material for filling of construction sites. In case, the borrow pits developed by the Contractor, there will be impacts on local topography, landscaping and natural drainage.	The Contractor shall • Identify borrow pits in consultation with the local ULB staff • Obtain the borrow material from: - barren land or land without tree cover outside the road reserve; - excavating land and creating new water tanks/ponds; - land acquired temporarily outside the road reserve; - excavation of proposed trenches; • Dig the borrow pits continuously. Ridges of not less than 8 m widths shall be left at intervals not exceeding 300 m and small drains should be cut through the ridges to facilitate drainage • Slope the bed level of the borrow pits, as far as possible, down progressively towards the nearest

		cross drain, if any, and do not lower it than the bed of the cross-drain, to ensure efficient drainage. • Do not locate the borrow pits within 500 m of any identified archaeological, religious or cultural sites if any. • Follow the below for restoration of borrow areas - Return stockpiled topsoil to the borrow pit if is used for agriculture; - Stabilize the banks of the borrow pit with the top soil if it is used for fish ponds by compaction - Return stockpiled top soil to the borrow pit and all worked areas to be stabilised through re-vegetation using local plants. - Control at each site by ensuring that the base of the borrow pit drains into a sediment trap prior to discharging from the site.

17 ECoP 15.0: Borrow Areas Development and Operation

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Development and operation of borrow areas	Generally excavated materials will be used as borrow material for filling f construction sites. In case, the borrow pits developed by the Contractor, there will be impacts on local topography, landscaping and natural drainage.	• The Contractor shall • Identify borrow pits in consultation with the local ULB staff • Obtain the borrow material from: • - barren land or land without tree cover outside the road reserve; • - excavating land and creating new water tanks/ponds; • - land acquired temporarily outside the road reserve; • - excavation of proposed trenches; • Dig the borrow pits continuously. Ridges of not less than 8 m widths shall be left at intervals not exceeding 300 m and small drains should be cut through the ridges to facilitate drainage • Slope the bed level of the borrow pits, as far as possible, down progressively towards the nearest cross drain, if any, and do not lower it than the bed of the cross-drain, to ensure efficient drainage. . • Do not locate the borrow pits within 500 m of any identified archaeological, religious or cultural sites if any. • Follow the below for restoration of borrow areas are: - Return stockpiled topsoil to the borrow pit if it is used for agriculture; - Stabilize the banks of the borrow pit with the top soil if it is used for fish ponds by compaction; - Return stockpiled topsoil to the borrow pit and all worked areas to be stabilized through re-vegetation using local plants. • Control at each site by ensuring that base of the borrow pit drains into a sediment trap prior to discharging from the site.

Table 13: Schedule for Consultations

S. no.	Activity	Main Responsible Agency	Other Agency / Department Involved	Consultation Tool	Stakeholders	Start Up				Transition Phase												Operation & Maintenance Phase
						Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	
1	**Start Up Phase**																					
1.1	Display of Feasibility Report	PIU	ULB	Dissemination	Public																	
2	**Project Preparation**																					
2.1	Project Information & ESMP	PIU	ULB	Dissemination	Community																	
2.2	Finalization of Alignment	Operator	ULB/KUIDFC	Survey	Community																	
2.3	Display of Finalized Alignment	Operator	PIU/SPV or ULB	Dissemination	Public																	
3.1	**Temporary Usage of Land**																					
3.1.1	Setting-up of Construction Camp	Contractor	Operator	Consultation	Property Owner																	
3.1.2	Plan for Diversion of Traffic	Contractor	Operator	Consultation	Property Owner																	
3.1.3	Plan for Disposal of Wastes	Contractor	Operator	Consultation	Property Owner																	
3.1.4	Plan for Extraction of Water	Contractor	Operator	Consultation	Property Owner																	
4.	**Transition Phase**																					
4.1	Redressal of Grievances	Contractor and Operator	PIU/SPV	Consultation	Property Owner																	
5	**Operations & Maintenance Phase**																					
5.1	Water Quality and Water Losses	Operator	PIU/SPV	Consultation	Community																	