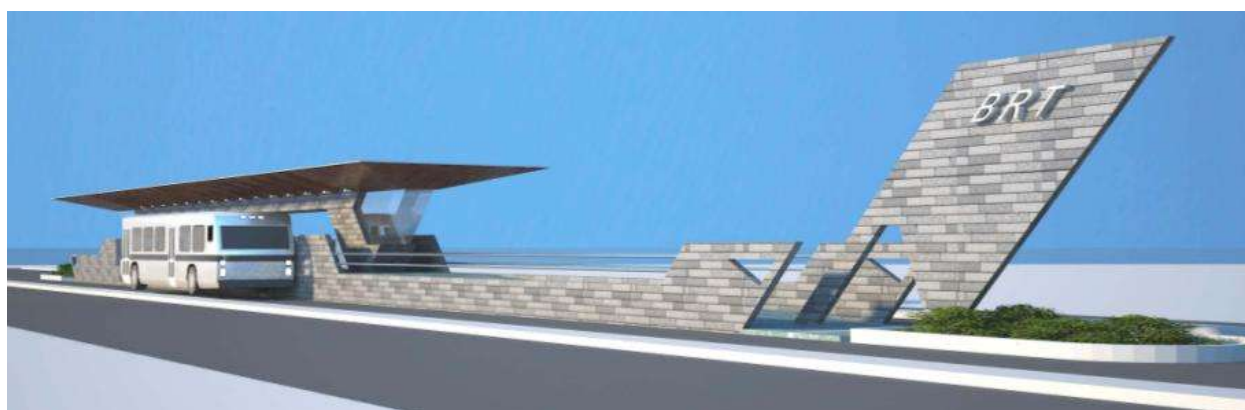


Directorate of Urban Land Transport

# **IMPLEMENTATION OF BUS RAPID TRANSIT SYSTEM IN HUBLI – DHARWAD**

## **ENVIRONMENT MANAGEMENT PLAN (ROAD COMPONENT)**



**HUBLI-DHARWAD BRTS COMPANY LIMITED**

**5-1-2013**

## Table of Contents

<b>1.</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	Project description .....	1
<b>2.</b>	<b>ENVIRONMENTAL IMPACTS IDENTIFIED .....</b>	<b>5</b>
2.1	Physical Environment .....	5
2.1.1	Air.....	5
2.1.2	Noise.....	5
2.1.3	Water Resources.....	5
2.1.4	Geology & Soil .....	6
2.2	Natural Environment.....	7
2.2.1	Flora.....	7
2.2.2	Fauna .....	7
<b>3.</b>	<b>ENVIRONMENTAL MANAGEMENT PLAN .....</b>	<b>8</b>
3.1	Pre-Construction Stage.....	8
3.1.1	Pre-Construction Activities by KRDCCL.....	8
3.1.2	Pre-Construction Activities by Contractor/Engineer .....	8
3.2	Construction Stage.....	8
3.2.1	Construction stage activities by the contractor .....	8
3.2.2	Construction Stage Activities by the KRDCCL .....	9
3.3	Operation Stage.....	9
3.4	Other Activities.....	9
<b>4.</b>	<b>IMPLEMENTATION ARRANGEMENTS .....</b>	<b>51</b>
4.1	Environmental Monitoring Plan .....	51
4.1.1	Monitoring Indicators.....	51
4.2	Reporting System.....	55
<b>4.3</b>	<b>Environmental Audit .....</b>	<b>56</b>
4.4	Institutional Setup .....	56
4.5	Good Environmental Construction Guidelines.....	57
<b>5.</b>	<b>EMP BUDGET .....</b>	<b>58</b>

## List of Tables

<b>Table 1-1:</b> Applicable Laws and Regulations.....	3
<b>Table 2-1:</b> Impacts on water resources due to construction activities.....	5
<b>Table 2-2:</b> Surface water Bodies along proposed BRT.....	6
<b>Table 3-1:</b> Environmental Management Plan.....	10
<b>Table 4-1:</b> Environmental Monitoring Indicators.....	51
<b>Table 4-2:</b> Environmental Monitoring Plan.....	53
<b>Table 4-3:</b> Summary details of Reporting.....	55
<b>Table 4-4:</b> Institutional Responsibilities.....	56
<b>Table 4-5:</b> Guideline for Good Environmental Practices.....	57
<b>Table 5-1:</b> Budgetary Provisions for Environmental Management Measures.....	58

## List of Figures

Figure 1-1: Proposed BRT Corridor.....	2
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## List of Abbreviation

AAQM	: Ambient Air Quality Monitoring
BRTS	: Bus Rapid Transit System
BSNL	: Bharat Sanchar Nigam Ltd
CBT	: Central Bus Terminal
CPCB	: Central Pollution Control Board
CSC	: Construction Supervision Consultant
CO	: Carbon Monoxide
CoI	: Corridor of Impact
DPR	: Detailed Project Report
DULT	: Directorate of Urban Land Transport
EA	: Environmental Assessment
EMP	: Environmental Management Plan
ESMF	: Environmental and Social Framework
FGDs	: Focus Group Discussions
GEF	: Global Environment Facility
GPS	: Global Positioning Systems
GoI	: Government of India
HC	: Hydro Carbon
HDMC	: Hubli Dharwad Municipal Corporation
ITS	: Intelligent Transport System
IRC	: Indian Roads Congress
KRDCL	: Karnataka Road development Corporation Ltd
KSPCB	: Karnataka State Pollution Control Board
LMV's	: Light Motor Vehicle
MoEF	: Ministry of Environment and Forest
MSL	: Mean Sea Level
MLD	: Million Litres Per Day
NAQMP	: National Air Quality Monitoring Programme
NGO	: Non-Government Organisation
NWKRTC	: North West Karnataka Road Transport Corporation
NoC	: No Objection Certificate
NO <sub>2</sub>	: Nitrogen Oxide
OCBS	: Old Central Bus Stand
PAP's	: Project Affected People
PUC	: Pollution under Control Certificate
PWD	: Public Works Department
RAP	: Resettlement Action Plan
RoW	: Right of Way
RTO	: Regional Transport Office
SPV	: Special Purpose Vehicle
SUTP	: Sustainable Urban Transport Project
SEIAA	: State/Union territory Environment Impact Assessment Authority
VUP's	: Vehicle Under Pass

# 1. INTRODUCTION

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## 1.1 Project description

1. Hubli – Dharwad state highway is the one of the most congested road stretches in North West Karnataka region. To ease the growing traffic from Hubli – Dharwad, the Government of Karnataka, through the Karnataka Road Development Corporation Limited has taken up the widening of the existing two lane state highway to a divided four lane carriageway. To provide better transportation facilities between the two urban areas of Hubli and Dharwad, and with an objective to improve travel speeds, reliability, and quality of public transport services, a BRT facility is proposed along the corridor.

2. The project road starts from Hubli CBT to Dharwad CBT, However, the main corridor starts from Hosur circle, Hubli (Chainage 0/0) and ends at Jubli circle, Dharwad (chainage 18.850). The existing corridor is a two lane road with median upto urban limit. As per the revenue records, the project corridor traverses through 10 villages (MT Sagar (CTS), Unkal (CTS), Unakal Revenue, Bhairidevarakoppa, Amaragol, Rayapur, Sattur, Navalur, Lakkammanahalli and Dharwad (CTS)). The corridor caters many education institutions (engineering colleges, arts and science colleges and government & private schools upto higher secondary levels), hospitals (cancer hospital, government / private hospitals) and government offices (Karnataka power, NWKRTC etc.).

3. The presence of some of the best education institutions and rapid growing auto market and other commercial business keeps the corridor busy throughout the day. The project corridor is also known for business in automobiles sector; all the major car brands / two wheeler showrooms can be observed along the corridor, which is followed by the banking sector. Environmental sensitive features are the presence of Unkal Lake (3/300), Rayapur Lake (9/400) and temples (including Iskcon temple). There are no notified reserved forests/ protected areas in the vicinity of the project roads. The existing road condition in Hubli Dharwad is a major cause of concern. The road is highly dangerous especially for two wheelers and LMV's due to the absence of the black top in many sections of the road and presence of the potholes. Many of the sub arterial and collector roads linking the project corridor are also in poor condition. Pedestrian safety is poor with either no footpaths or footpaths in poor condition. Lighting is not as per standards.

4. The proposed project includes the following major components:

- Widening of 18.9 km of road (2 lane undivided carriage way to 8 lane carriage way (4 lane for BRTS and 4 lane for mixed traffic)) under KRDC road project between Hosur circle and Jubilee circle
- Improvements within the available RoW of 3.1 km and 0.6 km of road within Hubli and Dharwad cities, including the following links (i) Hubli CBT to Hubli railway station, (ii) Hubli railway station to Hubli OCBS (iii) Hubli OCBS to Hosur circle and (iv) Jubilee circle to Dharwad CBT

5. BRTS project, including all BRTS physical infrastructure such as stations, depot, terminals etc., BRTS operational infrastructure such as ITS, ATC, buses etc., **This Environmental Management Plan provides the mitigation measures to be implemented for**

- (i) **Widening of 18.9 km of road (2 lane undivided carriage way to 8 lane carriage way (4 lane for BRTS and 4 lane for mixed traffic)) under KRDC road project between Hosur circle and Jubilee circle**
- (ii) **SPV : “Hubli-Dharwad BRTS Company Ltd” will be responsible for developing the BRTS corridor within city limits between Hosur cross to CBT in Hubli and similarly between Jubilee circle to CBT in Dharwad.**

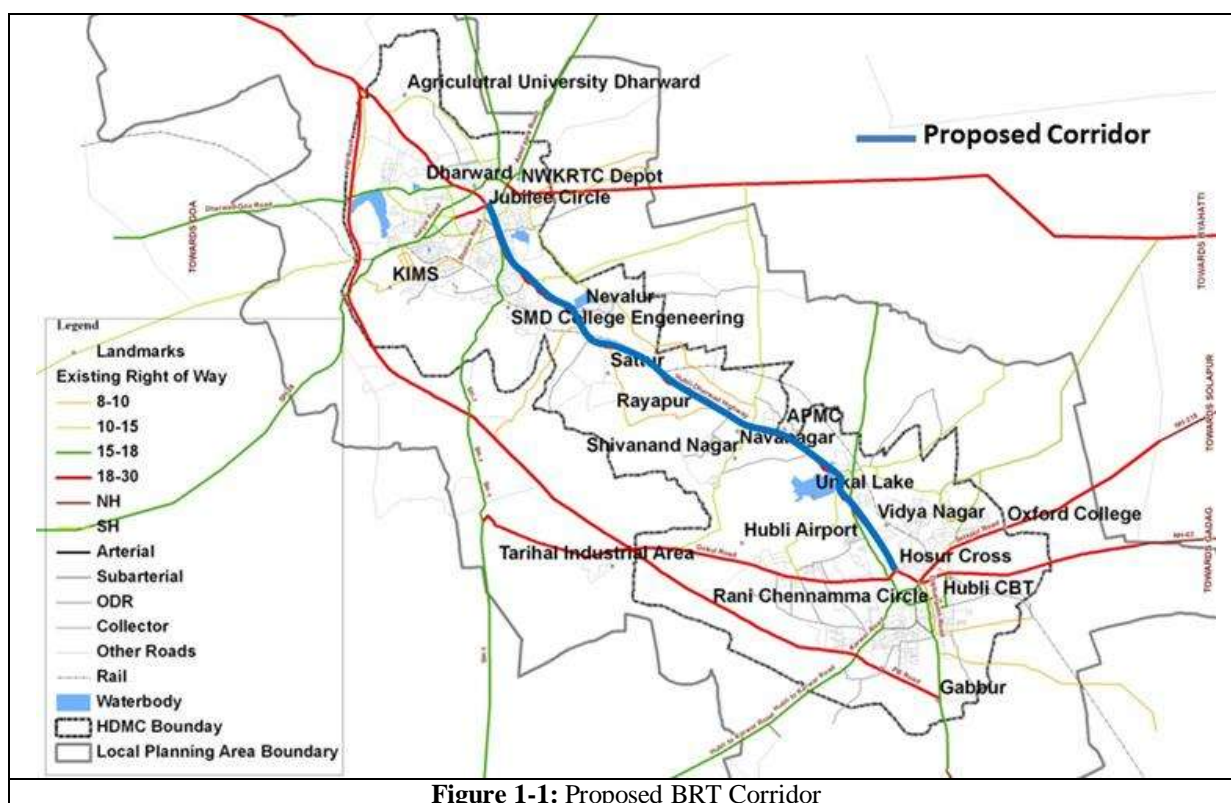


Figure 1-1: Proposed BRT Corridor

## 1.2 Context for the EMP

6. The management measures have been identified for the specific environmental issues identified in the EIA. This EMP document is structured to be standalone document, and included as part of the bid documents for implementation by the contractor. In addition, this EMP provides guidance to KRDC in effective supervision and monitoring of the implementation of the environmental measures proposed.

## 1.3 Clearance Requirements

7. As per the new amendment dated 4th April, 2011 to EIA notification 2006, widening and expansion of existing state highways have been exempted from the ambit of environmental clearances, and have been not categorized either as Category A or Category B. Therefore, the

project does not require clearances from the State Environmental Impact Assessment Authority or the MoEF. However, the project shall require obtaining consent from competent authorities such as the KSPCB, for '*Consent to Establish*' by submitting a Common Application (as per Schedule-I), under Water (Prevention and Control of Pollution) Act, 1974, Air (Prevention and Control of Pollution) Act, 1981) and authorization under Hazardous Wastes (Management and Handling) Rules, 1989, as amended. In addition, clearances from the Forest department<sup>1</sup> for the felling of trees within the proposed RoW. The clearances to be obtained by KRDCCL / contractor prior to commencement of civil works are presented in **Table 1-1**.

**Table 1-1: Applicable Laws and Regulations**

Sl. No	Clearances	Acts	Approving Agency	Applicability to the Project	Time Required	Responsibility	
						Execution	Supervision
<b>PROJECT PREPARATION STAGE</b>							
1	No Objection Certificate (NOC)	Water (Prevention and Control of Pollution) Act 1974, Air (Prevention and Control of Pollution) Act 1981	Karnataka Pollution Control Board	Applicable	3 months	KRDCL	KRDCL, WB Projects, CSC
2	Permission for removal of tree growth within the PROW Felling conversion and removal from stump site	Forest Conservation Act 1980 The Karnataka Preservation of Trees Act, 1976	Local Divisional Forest Officer (Deputy Conservator of Forests/Tree Officer)	Applicable	Already obtained	Forest department	KRDCL
<b>PROJECT IMPLEMENTATION STAGE</b>							
3	Permission for Withdrawal of Ground Water	Environment Protection Act 1986	Central Ground Water Board Water Resource department, Karnataka	Applicable	2 months	Contractor	KRDCL, WB Projects, CSC
4	Permission for Withdrawal of Surface Water from Rivers, Nala, Water harvesting structure/ Reservoirs/ Ponds/ Irrigation canals	Karnataka State Water Policy, 2002	Irrigation Department, Karnataka	Applicable (If the contractor is extracting surface water)	3 months	Contractor	KRDCL, WB Projects, CSC
5	Hot mix plant, Crushers, Cement Batching Plant	Air (Prevention and Control of Pollution) Act. 1981	Karnataka Pollution Control Board	Applicable	3 months	Contractor	KRDCL, WB Projects, CSC
6	Storage of Hazardous Chemicals	Hazardous Waste (Management and Handling) Rules 1989 and Manufacturing Storage and Import of Hazardous Chemicals Rules 1989	Karnataka Pollution Control Board	Applicable	3 months	Contractor	KRDCL, WB Projects, CSC
7	Disposal of Hazardous Waste	Hazardous Waste (Management and Handling) Rules 1989	Karnataka Pollution Control Board	Applicable	2 months	Contractor	KRDCL, WB Projects, CSC
8	Disposal of Construction Waste and liquid effluent from Labour camps	Water (Prevention and Control of Pollution) Act 1974	Karnataka Pollution Control Board	Applicable	2 months	Contractor	KRDCL, WB Projects, CSC
9	Pollution Under Control Certificate	Central Motor Vehicles Act 1988	Department of Transport, Govt. of Karnataka	Applicable	1 Month	Contractor	KRDCL, WB Projects, CSC
10	Employing Labour	Executing Agency of Building and other construction act, 1996	District Labour Commissioner	Applicable	1 Week	Contractor	KRDCL, WB Projects, CSC

<sup>1</sup> The clearances from the Forest department has already been obtained by KRDCCL for the felling of 1750 trees within the RoW.

Sl. No	Clearances	Acts	Approving Agency	Applicability to the Project	Time Required	Responsibility	
						Execution	Supervision
11	Registration of Workers	Labour welfare Acts.	District Labour Commissioner	Applicable	1 Month	Contractor	KRDCL, WB Projects, CSC

*Source: Acts and Rules, Govt of India*



## 2. ENVIRONMENTAL IMPACTS IDENTIFIED

8. Environmental Impact Assessment Carried out for the project identified the major impacts that are likely from the implementation of the project. These issues are briefly presented in this section to give an overview and context in which the EMP has been formulated.

### 2.1 Physical Environment

#### 2.1.1 Air

9. Air quality along the project road alignment will be adversely impacted at congested locations and major urban settlements like Unkal Revenue, Bhairidevarakoppa, Amaragol, Rayapur, Sattur, Navalur and Lakkammanahalli. Vehicular emissions are one of the major sources of air quality impacts of highway projects. As the project envisages improvement of road conditions for smooth traffic flow, the project will have beneficial impact on air quality of the region during its operation. However, when viewed with respect to the existing ambient air quality or with respect to compliance of ambient air quality standards during the post improvement phase of the road stretch, due to the increase in the traffic volume, the impact on air quality along the project road is likely to be significant.

#### 2.1.2 Noise

10. During the construction phase of the road, the major sources of noise pollution are vehicles transporting the construction material to the construction yard and the noise generating activities at the yard itself. Mixing, casting and material movement are primary noise generating activities in the yard and will be uniformly distributed over the entire construction period. As the project road passes through populated areas at villages and urban areas and several sensitive receptors such as colleges and religious institutions are located along the road, people in these places will be exposed to the high noise levels during the project construction period.

#### 2.1.3 Water Resources

11. The typical impacts on water quality during road construction are summarized in **Table 2-1**.

**Table 2-1:** Impacts on water resources due to construction activities

Sl. No	Impacts Due To Construction	Indicators
1	Impact on water bodies	Offset distance from the CoI from the edge of the embankment
2	Loss of other water supply sources	Number of wells, hand pumps (if any) affected
3	Alteration of drainage, run off, flooding	No. of cross drainage channels
4	Depletion of Ground Water recharge	Area rendered impervious
5	Contamination from fuel and lubricants	Nature and quantum of contaminants
6	Contamination from improper sanitation and Waste Disposal in Construction Camps	Area of camp / disposal site and proximity to water bodies / channels
7	Use of Water Supply for Construction	Quantum of water used

12. Based on the detailed assessment, few surface water bodies were identified along the project corridor. The details of the water bodies are given in the **Table 2-2**.

**Table 2-2:** Surface water Bodies along proposed BRT

Sl.no	Water Body	Chainage	Status
1	Unkal Lake	3/300 to 4/200	Perennial
2	Pond	4/800 to 4/900	Seasonal
3	Rayanpura Tank	9/300 to 9/500	Seasonal
4	Navalur Lake (200m away from BRT)	14/100 to 14/200	Perennial

*Source: Detailed survey*

13. As per the proposed widening options, it can be concluded that no other water bodies except Rayapura Tank, are affected. The loss of tank surface area has been compensated by deepening the tank to an additional depth of 1.31m to maintain the actual capacity of the tank. Being a seasonal tank, the construction activity is expected to have minimum impact on the Rayanpura Tank. The proposed cross section near Unkal Lake has been designed in such a way that no impact is envisaged to the water front or drains located near the lake. All the culverts guiding towards the lake area are strengthened and widened. Hence no impact is envisaged.

#### **2.1.4 Geology & Soil**

14. As the proposed road passes through flat and rolling terrain, no significant impact on geology is anticipated from activities involved in construction of proposed road. However, road construction from activities will require supply of road building materials, which should be collected from approved quarry sites. Likely impact on the geology is due to the uncontrolled blasting in the quarries supplying aggregates for construction at these sites. As these quarries are licensed, the prevalent rules on blasting will be adhered to. Hence, the impact on general geology of the region is insignificant. At the construction sites, no blasting is envisaged.

15. In this project contamination of the soil may take place, from the following activities at the construction zones, construction labour camps, construction plant sites and other auxiliary facilities required for the construction. Details of the activities from which the contamination can occur are presented below;

- Scarified bitumen wastes, over production of bituminous product,
- Debris generation due to dismantling of structures,
- Maintenance of the machinery and operation of the diesel generator sets on site,
- Oil Spill from the operation of the diesel pumps and diesel storage, during transportation and transfer, parking places, and diesel generator sets,
- Operation of the emulsion sprayer and laying of hot mix,
- Operation of the residential facilities for the labour and officers,
- Storage and stock yards of bitumen and emulsion,
- Excess production of hot mix and rejected materials

## 2.2 Natural Environment

### 2.2.1 Flora

16. Right of Way for the road needs to be cleared of vegetation for construction of the road. These will involve cutting of the trees within the proposed RoW. The trees felling in this region will not have significant impact on the environment. However, mitigation measures will be taken with almost care. In the long term, the proposed plantation will have direct positive impact on the ecological resources. As per detailed assessment and inventory 1750<sup>2</sup> trees will be affected due to the project. These are mostly Banyan trees (*Ficus benghalensis*), Eucalyptus (*E. angophoroides*), Common Fig tree (*F. carica*), Plantain (*Musa paradisiaca*), coconut trees (*Cocos nucifera*), sal (*Shorea robusta*), Teak (*Tectona grandis*), bamboo trees (graminaceous plant), Pine (*Pinus pinea*) and Mango tree (*Mangifera indica*). There is no presence of endangered flora in the project area and hence, no impacts on such species are anticipated.

### 2.2.2 Fauna

17. The alignment does not encroach up on the forest lands. The construction and operation phase of the project doesn't possess threat to the fauna population available in the project area. There are no endangered species reported in the project area and hence, no impacts on these species are anticipated. However, adequate measures as per the management plan shall be implemented to offset any impacts that are likely to arise.

## 2.3 Social Environment

18. Impact of the proposed project on the socio-economic environment is expected to be overwhelmingly beneficial and is also one of the major objectives of undertaking these project initiatives. However, there are certain negative impacts on the socio-economic situation of the project area as listed below.

- Population increase
- Influx of construction workers
- Economic impacts
- Acquisition of land and structures
- Relocation of community structures within the corridor-of-impact

19. Influx of construction workers and relocation of community structures in the corridor of impact are the major impacts associated with the social environment. Contractor would setup necessary infrastructure and the construction camps to accommodate the construction workers. This would reduce any increase in exploitation of infrastructure of the project surrounding area.

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<sup>2</sup> Estimated by the Forest department, Karnataka

## **3. ENVIRONMENTAL MANAGEMENT PLAN**

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20. A description of the various management measures during various stages of the project is provided in the **Table 3-1**.

### **3.1 Pre-Construction Stage**

#### **3.1.1 Pre-Construction Activities by KRDC**

21. Prior to the contractor mobilization, the KRDC will ensure that an encumbrance free CoI is handed over to enable the start of construction. The RoW clearance involves the following activities:

- Clearance of the RoW including removal of trees, and
- Relocation of common property resources impacted, including cultural properties as temples and community assets as hand pumps and other utilities

#### **3.1.2 Pre-Construction Activities by Contractor/Engineer**

22. The pre-construction stage involves mobilisation of the contractor, the activities undertaken by the contractor pertaining to the planning of logistics and site preparation necessary for commencing construction activities. The activities include:

- Joint field verification of EMP by the Engineer and Contractor
- Modification (if any) of the contract documents by the Engineer
- Procurement of construction equipment / machinery such as crushers, hot mix plants, batching plants and other construction equipment and machinery
- Identification and selection of material sources (quarry and borrow material, water, sand etc.)
- Selection, design and layout of construction areas, hot mix and batching plants, labour camps etc.
- Planning traffic diversions and detours, including arrangements for temporary land acquisition

### **3.2 Construction Stage**

#### **3.2.1 Construction stage activities by the contractor**

23. Construction stage activities require careful management to avoid environmental impacts. Activities that trigger the need for environmental measures to be followed include:

- Imbibing environmental principles at all stages of construction as good engineering practices
- Implementation of site-specific mitigation/management measures suggested
- Monitoring the quality of environment along the construction sites (as air, noise, water and soil)

24. There are several other environmental issues that have been addressed as part of good engineering practices, the costs for which have been accounted for in the Engineering Costs. They

include improvement of roadside drainage, provision of additional cross drainage structures or rising of road height in flood prone stretches and reconstruction and improvement of bunds, deepening/ restoration of the affected water bodies.

### **3.2.2 Construction Stage Activities by the KRDCCL**

25. The construction stage involves the following activities by KRDCCL:

- Tree plantation along the project corridor and landscaping along junctions by the KRDCCL .
- Monitoring of environmental conditions through approved monitoring agency

### **3.3 Operation Stage**

26. Operation stage activities are to be carried out by the Environmental Cell includes mostly environmental monitoring (Ambient air quality, Noise levels, Water quality and Soil quality) of operational performance of the various mitigation/enhancement measures carried out as a part of BRTS.

### **3.4 Other Activities**

- Orientation of Implementation agency staff towards project specific issues of EMP implementation
- Conducting additional studies for issues identified during any stage of project preparation/ implementation

**Table 3-1: Environmental Management Plan**

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
<b>1.0</b>	<b>PRE-CONSTRUCTION STAGE</b>					
<b>1.1</b>	<b>Pre-construction activities by KRDCCL</b>					
<b>1.1.1</b>	Land Acquisition:	The acquisition of land and properties (Govt. /private) will be carried out in accordance with the LA act / KHA.  KRDCCL has to ascertain that the environmental impacts arising due to the additional acquisition of land during project implementation shall be addressed and the same shall be integrated in the EMP and other relevant contract documents.	Corridor of Impact.	Karnataka Highway Act and its amendments	KRDCL, Revenue Dept., NGOs, Collaborating Agencies	KRDCL
<b>1.1.2</b>	Tree Cutting:  The total number of trees to be fell for the project is 1750	As far as possible maximum efforts shall be made to minimize the number of trees proposed to be felled by adopting suitable on the spot adjustment of engineering designs.  Trees shall be removed from the Corridor of Impact and construction sites before commencement of construction. Prior Permission shall be obtained from the Forest Officer for the felling of trees.  The trees cut shall be disposed off through auction (inclusive of tree stumps). This disposal shall be done immediately to ensure that the traffic movement is not disrupted. Progress of tree cutting shall be reported to the KRDCCL.	Corridor of Impact.  Ch 0+000 to 4+200 (35 m) Ch 4+200 to 15+900 (44m) Ch 15+900 to 18+900 (35m)	Design MoRTH 201.6	Karnataka Forest Department, Tree Felling Contractor, KRDCCL	KRDCL, Site Engineer/Supervision Consultant
<b>1.1.3</b>	Utility Relocation and Common Property	All community utilities and common property resources such as stand posts,	Corridor of Impact. Ch 0+000 to 4+200	Design MoRTH 110.7	KRDCL; Concerned	KRDCL, Site Engineer/Supervision Consultant

<sup>3</sup> MoRTH Clause 111.1 with modifications mentioned in Appendix 3.15 shall be applicable for all the EMP Clauses

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
	Resources (CPR's)	<p>bore wells, wells, ponds, water supply lines, toilets, sewage lines, drainage systems, optical fiber cables, electric power supply lines, transformers, irrigation pump houses, telephone and television cables shall be relocated and restored before the commencement of the road improvement activity.</p> <p>While relocating these utilities and facilities, all concerned agencies including KRDCCL shall take necessary pre-cautions and shall provide barricades/ delineation of such sites to prevent accidents including accidental fall into bore holes, pits, drains both during demolition and construction/relocation of such facilities. Standard safety practices shall be adopted for all such works.</p> <p>Early completion of works for schools, colleges and health centres including shifting of gates and construction of boundary walls shall be planned during holidays so that the risk of accidents and disturbance to day-to-day activity of such institutions are minimized.</p> <p>Proper placement (as per codes) of passenger shelters/bus stops shall be ensured to prevent distress to the commuters and passengers.</p> <p>Relocation sites for all CPRs shall be selected in consultation with concerned communities, local administrative authorities/departments.</p>	(35 m) Ch 4+200 to 15+900 (44m) Ch 15+900 to 18+900 (35m)		Agencies/Departments; Contractor	
<b>1.1.4</b>	Cultural and Religious Properties	The compensation measures shall be applied before construction begins for all cultural properties (having title	Religious and cultural location	Design	KRDCL; NGOs; Contractor; Concerned Community	KRDCL, Site Engineer/Supervision

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
12	Cultural and Religious Property are getting impacted by the project. (5 structure are having major impact and 7 structures are having minor impacts)	holders) within the CoI and the structures that would be affected fully or partially.  Cultural properties that needs to be encroached in the RoW shall not be entitled for any compensation measures  No cultural properties or religious structures shall be removed without the knowledge and written consent of the concerned parties or communities and local administration as the case may be.  Road safety measures like provision of additional rumble strip, cautionary boards, pedestrian crossing, speed breakers, signal and street light facilities shall be provided near the cultural and religious properties.	Major Impacted temples: Ramalingeshwarar Temple (2/700) Anjaneya Temple (3/200) Rukmani Temple (4/700) Ganapathy Temple(4/700) Mosque (5/300)  Minor impacted temples: Lakshmi temple (2/000) Shrine (4/400) Balararuti Prajama Temple (7/800) Iskcon Temple (9/200) Temple (9/400) Jai Sri Ram Temple (10/300) Temple (16/500)			Consultant
<b>1.1.5</b>	Orientation of Implementing Agencies	The KRDCCL shall organize orientation sessions during all stages of the project. This shall include on-site training (general as well as specific to the context of this subproject) as well.  These sessions shall involve concerned division-level staff of the KRDCCL involved in the sub-project, Staff of the Site Engineer/ Supervision Consultant and the implementing agencies.			KRDCL, Site Engineer/Supervision Consultant	KRDCL
<b>1.2</b>	<b>Pre-construction activities by the Contractor/Engineer of CSC</b>					
<b>1.2.1</b>	Joint Field Verification	The Engineer - Incharge of Supervision Consultant and the Contractor shall carry out joint field verification to	Project Corridor Ch 0+000 to 4+200 (35 m)	EMP	Contractor; Environmental Officer of SC	KRDCL



Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		ascertain the necessity of, environmental and community resources wherever such representations or suggestions in writing have been received and forwarded by the project authority or by the site engineer in accordance with the local situations.	Ch 4+200 to 15+900 (44m) Ch 15+900 to 18+900 (35m)			
		The complaints/suggestions together with the observations and expert opinion of the joint verification team containing the need for additional protection measures or changes in design/scale/nature of protection measures including the efficacy of enhancement measures suggested in the EMP shall be summarized in a written document containing all the details with date, time, place and signature of the individuals involved and this shall be sent to KRDCCL for approval.				
		The KRDCCL shall maintain proper documentation and justifications/reasons in all such cases where deviation from the original EMP is proposed.				
1.2.2	Assessment of Impacts due to Changes/Revisions in the Project Work	The Engineer - Incharge of CSC shall assess the impacts and revise/modify the EMP in consultation with the KRDCCL in accordance to the recommendation made by the field survey party in the event of changes /revisions (including addition or deletion) in the project's scope of work.	Project Corridor Ch 0+000 to 4+200 (35 m) Ch 4+200 to 15+900 (44m) Ch 15+900 to 18+900 (35m)	EMP	Contractor; Environmental Officer of SC	KRDCCL
1.2.3	Procurement of Machinery					
1.2.3.1	Crushers, Hot-mix Plants & Batching Plants	Crusher, Hot-mix and batching plants shall be located 1000m away from settlements and commercial establishments, preferably in the downwind direction. No plants can be set-up within 1000m from the	Project Corridor: All construction machineries (Crushers, Hot-mix Plants & Batching	Contract, MoRTH: 111.1, GoI Air & Noise Standards, OSHA Standards	Contractor	Environmental Officer of SC ; KRDCCL

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>residential/ settlement locations.</p> <p>The Contractor shall submit a detailed layout plan for all such sites and seek prior approval of Engineer - Incharge of CSC before entering into formal agreement with a land owner for setting-up such sites. Actions by CSC and KRDCCL against any non-compliance shall be borne by the Contractor at his own cost.</p> <p>Arrangements to minimize dust pollution through provision of windscreens, mist spray units, and dust encapsulation shall have to be provided at all such sites.</p> <p>Specifications of crushers, hot mix plants and batching plants shall comply with the requirements of the relevant current emission control legislations (preferably Bharat stage – III for Diesel Construction Machinery) and Consent / NOC for all such plants shall be submitted to the CSC and KRDCCL.</p> <p>No such installation by the Contractor shall be allowed till all the required legal clearances are obtained from the competent authority and the same is submitted to the KRDCCL and the CSC.</p> <p>The contractor shall procure metals and other construction materials from the KSPCB licensed quarry/ borrow areas (where the environmental monitoring/ management plan are in place) and submit a copy of their license to KRDCCL and CSC for verification.</p>	<p>Plants) should be keep/station 1000 m away from the settlements (Unakal Revenue, Bhairidevarakoppa Amaragol, Rayapur, Sattur, Navalur and Lakkammanahalli) adjacent to the proposed BRTS project corridor.</p>			

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
1.2.3.2	Other Construction Vehicles, Equipment and Machinery	<p>The discharge standards promulgated under the Environment Protection Act, 1986 shall be strictly adhered to. All vehicles, equipment and machinery to be procured for construction shall conform to the relevant Bureau of Indian Standard (BIS) norms.</p> <p>Noise limits for construction equipment's to be procured such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB (A), when measured at one metre distance from the edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986.</p> <p>Efficient and environment friendly equipment conforming to the latest noise and effluent emission control measures available in the market shall be used in the project.</p> <p>The Contractor shall maintain a record of PUC for all vehicles and machinery used during the contract period, which shall be produced to the KRDCCL and the Supervision Consultant for verification whenever required.</p>		Contract, Environment Protection Act, 1986 & MoRTH: 111.1	Contractor	Environmental Officer of SC ; KRDCCL
1.2.4	Identification & Selection of Material Sources					
1.2.4.1	Borrow Areas	Arrangement for locating the source of supply of material for embankment and sub-grade as well as compliance to environmental requirements, as applicable, shall be the sole responsibility of the contractor. The environmental personnel shall be required to inspect every borrow area location prior to approval.	Ecologically sensitive area (If any)	MoRTH: 305.2.2.2	Contractor	Supervision Consultant; KRDCCL

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
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		<p>Format for reporting shall be as per the Reporting Format (<b>Format EM-3 – Annexure 2 Environmental Reporting System and Guideline -3 Borrow area management</b>) for Borrow Area. The Engineer - Incharge of the CSC shall be required to inspect every borrow area location and evaluate such proposals in accordance to environmental requirements prior to issuing approval for use of such sites.</p> <p>. The borrow areas shall be atleast 500m from schools and village access roads.</p> <p>The Contractor shall not borrow earth from the selected borrow area until a formal agreement is signed between land owner and Contractor and a copy of this agreement is submitted to the Engineer – In-charge of the CSC. The Supervision Consultant shall report these facts to the KRDC along with the remarks in the prescribed format with documentary proofs.</p> <p>Planning of haul roads for accessing borrow materials shall be undertaken during this stage. The haul roads shall be routed to avoid agricultural areas. In case agricultural land is disturbed, the Contractor shall rehabilitate it as per Borrow Area guideline given in the EMF or as approved by the Engineer – In-charge of CSC.</p> <p>Haul roads shall be maintained throughout the operation period of the borrow areas by undertaking the required maintenance and repair works, which may include strengthening, pot</p>				

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
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		<p>hole repairing and diversions. Improvements shall be done to reduce inconvenience to users of these roads, residents living along the haul roads and minimize air and water pollution.</p> <p>Such measures shall include, but not limited to, frequent sprinkling of water, repairing of the road, road safety provisions (warning and inforamatory signage, flagmen etc.), and ensuring covering of loaded vehicles by waterproof tarpaulin; consultation with public and special precautions are required when measures are implemented near schools, health centers and settlement areas.</p> <p>All borrow areas whether in private, community or govt. land shall be restored either to the original condition or as per the approved rehabilitation plan (<b>Format OP2 - Annexure 2 - Redevelopment of Borrow Areas</b>) immediately upon completion of the use of such a source.</p>				
1.2.4.2	Quarries	<p>The Contractor shall identify materials from existing licensed quarries with the suitable materials for construction. Apart from approval of the quality of the quarry materials, the Engineer's representative shall verify the legal status of the quarry operation, as to whether approval from Karnataka State Government is obtained.</p> <p>No quarry and/or crusher units shall be selected or used, which is within 1000m from the forest boundary, wildlife movement path, breeding and nesting habitats and national parks/sanctuaries.</p>	<p>Quarry area should be located 1000m away from the settlements</p> <p>(Unakal Revenue, Bhairidevarakoppa Amaragol, Rayapur, Sattur, Navalur and Lakkammanahalli)</p>	MoRTH: 111.3	Contractor	Supervision Consultant; KRDC

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
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		No plants can be set-up within 1000m from the residential/ settlement locations				
		Contractor shall also work out haul road network used for quarry transport and report to Engineer - Incharge of Supervision Consultant who shall inspect and in turn report to KRDCCL on the suitability of such haul roads from safety of residents, biodiversity and other environment point of views.				
1.2.4.3	Arrangement for Construction Water	<p>The contractor shall source the requirement of water preferentially from surface water bodies, as lakes and tanks in the project area. The contractor shall be allowed to pump only from the surface Water bodies. Boring of any tube wells shall be prohibited.</p> <p>To avoid disruption/disturbance to other water users, the contractor shall extract water from fixed locations. The contractor shall consult the local people before finalizing the locations.</p> <p>Only at locations where surface water sources are not available, the contractor can contemplate extraction of ground water. Consent from the Engineer that "no surface water resource is available in the immediate area for the project" is a pre-requisite prior to extraction of ground water. The contractor shall need to comply with the requirements of Irrigation Department, Karnataka and seek their approval for doing so.</p>	All surface water bodies that can be used in the project	Contract	Contractor	Environmental Officer of SC ; KRDCCL
1.2.4.4	Sand (all river and stream beds used directly or indirectly for the project)	The contractor shall identify sand quarries with requisite approvals for the extraction of sand. In case of selection of new sites for sand quarrying, the Contractor shall obtain prior approval	All riverbeds recommended for sand extraction for the project.		Contractor	Environmental Officer of SC ; KRDCCL

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>and concurrence from Competent District Authority and the Engineer – Incharge of the CSC keeping in view the objections and convenience of the local population, who may restrain such activities for their own security and safety.</p> <p>Where the supplier of sand is another party, the authentic copy of lease agreement that has been executed between the local Tahasildar and the supplier has to be submitted to CSC and KRDCCL of the project, before any procurement is made from such a site.</p> <p>To avoid accidents and caving in of sand banks at quarry sites, sand shall be removed layer by layer. Digging deeper than the permissible limit has to be completely avoided by the Contractor. Such quarry shall be barricaded 10m away from the periphery on all sides except the entry point, so as to prevent accidental fall of domestic cattle, wildlife and human beings.</p>				
1.2.5	Labour Requirements	The contractor shall use unskilled labour drawn from local communities to avoid any additional stress on the existing facilities (medical services, power, water supply, etc.)	Along project corridor at construction sites	Contract	Contractor	Supervision Consultant; KRDCCL
1.2.6	Setting up construction sites					

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
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1.2.6.1	Construction Camp Locations – Selection, Design & Layout	<p>Construction camps shall not be proposed:</p> <p>(i) Within 1000m of Ecologically sensitive areas</p> <p>(ii) Within 1000m from the nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community. Layout of construction camps shall be as per the conceptual design presented in <b>Annexure 1</b>.</p> <p>Location's for stockyards for construction materials shall be identified at least 1000 m from watercourses. The waste disposal and sewage system for the camp shall be designed, built and operated such that no odour is generated.</p> <p>Unless otherwise arranged by the local sanitary authority, arrangements for disposal of excreta suitably approved by the local medical health or municipal authorities or as directed by Engineer shall be provided by the contractor.</p>	All Construction Workers Camps including areas in immediate vicinity.	Contract  <b>Annexure 1</b>	Contractor	Supervision Consultant; KRDC
1.2.6.2	Arrangements for Temporary Land Requirement	<p>The contractor as per prevalent rules shall carry out negotiations with the land owners for obtaining their consent for temporary use of lands for construction sites/ hot mix plants /traffic detours /borrow areas etc.</p> <p>The Engineer shall ensure that the site is cleared prior to handing over to the owner (after construction or completion of the activity) and it is included in the contract.</p>	Areas temporarily acquired for construction sites / hot mix plants / borrow areas / diversions / detours	Contract Document	Contractor	Supervision Consultant; KRDC
<b>2.0</b>	<b>CONSTRUCTION STAGE</b>					
<b>2.1</b>	<b>Construction Stage Activities by Contractor</b>					
<b>2.1.1</b>	<b>Site Clearance</b>					



Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
2.1.1.1	Clearing and Grubbing	<p>Site clearance including clearance of marked trees for felling and removal has to be carried out much before the actual road construction takes place.</p> <p>Structures and utilities (cabins, commercial properties, hoardings, overhead power transmission lines, cable connections, telephone lines, bore wells, stand posts, wells, statues, temples etc.) shall be compensated/relocated as per RAP and EMP provisions before tree felling; clearing or grubbing activities are to be undertaken as these activities may damage structures (private and govt.) and essential facilities/utilities of public use.</p> <p>All works shall be carried out in a manner such that the damage or disruption to flora is minimum. Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works shall be removed with prior approval from Engineer - Incharge of CSC.</p>	<p>Corridor of Impact Ch 0+000 to 4+200 (35 m) Ch 4+200 to 15+900 (44m) Ch 15+900 to 18+900 (35m)</p>	<p>Design MoRTH 201</p>	Contractor	Supervision Consultant; KRDCCL
2.1.1.2	Dismantling of Bridgework / Culverts	All necessary measures shall be taken especially while working close to cross drainage channels to prevent earthwork, stonework, materials and appendage as well as the method of operation from impeding cross-drainage at water canals and existing irrigation and drainage systems.	At locations where bridge works and culverts are proposed.	MoRTH 202.2	Contractor	Supervision Consultant; KRDCCL
2.1.1.3	Generation & disposal of Debris	Generated debris material will be suitably disposed off by the contractor either through filling up of borrow areas created for the project or at pre-designated disposal locations, subject to	Throughout Project Corridor	MoRTH 202.5 MoRTH 517	Contractor	Supervision Consultant; KRDCCL

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
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		<p>the approval of the Engineer-in-charge.</p> <p>Debris generated from pile driving or other construction activities will be disposed such that it does not flow into the surface water bodies or form mud puddles in the area. Disposal sites will be:</p> <ul style="list-style-type: none"> <li>• Located in the downwind side of residential areas</li> <li>• Not contaminate any water sources, rivers etc, and</li> <li>• Should have adequate capacity equal to the amount of debris generated.</li> <li>• Finalised taking in to account the Public perception about the location</li> <li>• Obtain permission from the Village Panchayat</li> <li>• Avoid productive lands</li> <li>• Give preference to available waste lands.</li> </ul>				
<b>2.1.1.4</b>	Non-bituminous construction wastes disposal	Location of disposal sites shall be finalized prior to completion of the earthworks on any particular section of the road. The Engineer shall approve these disposal sites conforming to the following (a) These are not located within designated forest area (b) The dumping does not impact natural drainage courses (c) No endangered/rare flora are impacted by such dumping. (d) Settlements are located at least 1.0km away from the site.	Disposal site locations	Contract MoRTH: 201.4 & 202.5 Section 2.1.1.3	Contractor	Supervision Consultant; KRDC
<b>2.1.1.5</b>	Bituminous wastes disposal	The disposal of bituminous wastes shall be done by the contractor at secure land fill sites, with the requisite approvals for	Throughout Project Corridor	Contract MoRTH: 201.4	Contractor	Supervision Consultant; KRDC

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
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2.1.1.6	Stripping, stacking and preservation of top soil	<p>the same from the concerned government agencies.</p> <p>The top soil from all sites including road side widening and working area, cutting areas, quarry sites, borrows areas, construction camps, haul roads in agricultural fields (if any) and areas to be permanently covered shall be stripped to a specified depth of 150mm and stored in stockpiles for reuse.</p> <p>A portion of the temporarily acquired area and/or RoW edges shall be earmarked for storing top soil. The locations for stacking shall be pre-identified in consultation and with approval of Engineer - Incharge of CSC. The following precautionary measures shall be taken by the Contractor to preserve the stockpiles till they are re-used:</p> <ul style="list-style-type: none"> <li>• Stockpile shall be arranged such that the slope does not exceed 1:2 (vertical to horizontal), and height is restricted to 2 m.</li> <li>• To retain soil and to allow percolation of water, the edges of the pile shall be protected by silt fencing.</li> <li>• Multiple handling is to be kept to a minimum to ensure that no compaction occurs.</li> <li>• Such stockpiles shall be covered with empty gunny bags or shall be planted with grasses to prevent loss during rains.</li> </ul>	Throughout Project Corridor	MoRTH: 301.3.2; Contractor MoRTH: 301.7; MoRTH: 301.3.3; MoRTH: 305.3; Guideline for Borrow Areas	Contractor	Supervision Consultant; KRDCCL

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
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		<p>Such stockpiled topsoil shall be utilized for</p> <ul style="list-style-type: none"> <li>• Covering reclamation sites or other disturbed areas including borrow areas (not those in barren areas)</li> <li>• Top dressing of road embankment and fill slopes</li> <li>• Filling up of tree pits and</li> <li>• In the agricultural fields of farmers, acquired temporarily that need to be restored.</li> </ul> <p>Residual topsoil, if there is any, shall be utilized for the plantation works along the road corridor. The utilization as far as possible shall be in the same area/close to the same area from where the top soil was removed. The stripping, preservation and reuse shall be carefully inspected, closely supervised and properly recorded by CSC.</p>				
2.1.1.7	Accessibility	<p>The Contractor shall provide safe and convenient passage for vehicles, pedestrians and livestock to and from roadsides and property accesses connecting the project road by providing temporary connecting road, as necessary.</p> <p>Construction activities that shall affect the use of side roads and existing accesses to individual properties, whether public or private, shall not be undertaken without providing adequate provision approved by the CSC.</p> <p>The Contractor shall take care that the cross roads are constructed in such a</p>	All along the project corridor, all access roads.	MoRTH specifications and IRC guidelines	Contractor	Supervision Consultant; KRDCL

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		sequence that construction work over the adjacent cross roads are taken up in a manner that traffic movement in any given area does not get affected.				
2.1.1.8	Planning for Traffic Diversions and Detours	<p>Detailed traffic control plans shall be prepared by the contractor and the same shall be submitted to the Engineer - Incharge of CSC for approval. The traffic control plans shall contain details of temporary diversions, traffic safety arrangements including night time safety measures, details of traffic arrangement after cessation of work each day, safety measures undertaken for transport of hazardous materials and arrangement of flagmen etc. to regulate traffic congestion.</p> <p>The Contractor shall provide specific measures for safety of pedestrians and workers as a part of traffic control plans. The Contractor shall ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.</p> <p>The Contractor shall also inform local community of changes in traffic routes and pedestrian access arrangements with assistance from CSC and KRDCCL.</p>	Traffic diversion and detour should be near education Institutions, markets and commercial areas in Unakal Revenue, Bhairidevarakoppa, Amaragol, Rayapur Sattur, Navalur and Lakkammanahalli.	MoRTH: 112; IRC SP:55	Contractor	Supervision Consultant; KRDCCL
<b>2.1.2</b>	<b>Construction Materials</b>					
2.1.2.1	Earth from Borrow Areas for Construction	<p>No borrow area shall be opened without permission of the Engineer – Incharge of CSC.</p> <p>Borrow pits shall not be dug continuously in a stretch. The location, shape and size of the designated borrow</p>	All along the project corridor, all access roads, sites temporarily acquired & all borrow areas	MoRTH: IRC 10 1961	Contractor	Supervision Consultant; KRDCCL

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>areas shall be as approved by the Engineer and in accordance to the IRC recommended practice for borrow pits for road embankments (IRC 10: 1961).</p> <p>The borrowing operations shall be carried out as specified in the guidelines for siting and operation of borrow areas</p> <p>The unpaved surfaces used for the haulage of borrow materials shall be maintained dust free by the contractor. Since dust rising is the most significant impact along the hauled roads, sprinkling of water shall be carried out twice a day along such roads during their period of use.</p>				
2.1.2.2	Quarries	<p>The Contractor shall obtain materials for quarries only after the approval of Department of Mines and Geology, Karnataka and the District Administration. A copy of this consent must be submitted to KRDCCL through Engineer –Incharge of CSC.</p> <p>The Contractor shall develop a Comprehensive Quarry Redevelopment Plan, as per the Mining Rules of the State and submit a copy to KRDCCL and CSC prior to opening of the quarry site.</p> <p>The quarry operations shall be undertaken within the rules and regulations in vogue.</p>	All along the project corridor and all haul roads	Forest Department as per Karnataka Forest Rules, 1969	Contractor	Supervision Consultant; KRDCCL
2.1.2.4	Blasting	<p>Except as may be provided in the contract or ordered or authorized by the Engineer, the Contractor will shall not use explosives. Where the use of explosives is so provided or ordered or authorized, the Contractor shall comply with the requirements of the following</p>	All blasting and Pre-splitting Sites.	MoRTH: 302.4	Contractor	Supervision Consultant; KRDCCL

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>Sub-Clauses of MoRTH 302 besides the law of the land, as applicable.</p> <p>The Contractor shall at all times take every possible precaution and shall comply with appropriate laws and regulations relating to the importation, handling, transportation, storage and use of explosives. The contractor shall at all times when engaged in blasting operations, post sufficient warning flagmen, to the full satisfaction of the Engineer.</p> <p>The Contractor shall at all times make full liaison with and inform well in advance and obtain such permission as is required from all Government Authorities, public bodies and private parties whomsoever concerned or affected or likely to be concerned or affected by blasting operations.</p> <p>Blasting shall be carried out only with permission of the Engineer. All the statutory laws, regulations, rules etc., pertaining to acquisition, transport, storage, handling and use of explosives shall be strictly followed.</p> <p>Blasting shall be carried out during fixed hours (preferably during mid-day) or as permitted by the Engineer. The timing shall be made known to all the people within 1000m (200m for pre-splitting) from the blasting site in all directions.</p>				
2.1.2.6	Water Extraction	Procurement of water is to be carried out as per Section 1.2.4.3. The contractor shall minimize wastage of water during construction.	All water bodies recommended to be used in the project	Section 1.2.4.3	Contractor	Supervision Consultant; KRDC

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
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2.1.2.5	Transporting Construction Materials	<p>All vehicles delivering materials to the site shall be covered to avoid spillage of materials.</p> <p>All existing highways and roads used by vehicles of the contractor, or any of his sub-contractor or suppliers of materials and similarly roads which are part of the works shall be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles</p> <p>The unloading of materials at construction sites close to settlements shall be restricted to daytime only.</p>	All along the Project corridor and all haul roads	MoRTH: 111.9	Contractor	Supervision Consultant; KRDC
<b>2.1.3</b>	<b>Construction work</b>					
2.1.3.1	Drainage and Flood Control	<p>Contractor shall ensure that no construction materials like earth, stone, ash or appendage disposed off so as not to block the flow of water of any water course and cross drainage channels.</p> <p>Where necessary adequate mechanical devices to bailout accumulated water from construction sites, camp sites, storage yard, excavation areas are to be pre-settled and arranged well in advance of the rainy season besides providing temporary cross drainage systems.</p> <p>The contractor shall take all adequate precautions to ensure that construction materials and excavated materials are enclosed in such a manner that erosion or run-off of sediments is controlled. Silt fencing shall be installed prior to the onset of the monsoon at all the required locations, as directed by Engineer - Incharge of CSC and KRDC.</p> <p>The contractor shall also ensure that no</p>	<p>Surface water sources/ drains/ Lake/ Ponds/ Tanks etc.</p> <p>Pond (4/800 to 4/900) and Rayapura Tank / Pond (9/300 to 9/500)</p>	MoRTH:305.3.7; MoRTH:306	Contractor	Supervision Consultant; KRDC



Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		material blocks the natural flow of water in any water course or cross drainage channel. Prior to monsoon, the contractor shall provide either permanent or temporary drains to prevent water accumulation in surrounding residential, commercial and agricultural areas.				
2.1.3.2	Siltation of Water Bodies and Degradation of Water Quality	<p>Contractor shall construct silt fencing at the base of the embankment construction near all water bodies (including wells) and around the stockpiles at the construction sites.</p> <p>Silt fencing shall be provided prior to the commencement of earthwork and shall continue till the stabilization of the embankment slopes are complete on the particular sub-section of the road.</p> <p>The contractor shall also put up sedimentation cum grease traps at the outer mouth of the drains located in truck lay byes and bus bays which are ultimately entering into any surface water bodies / water channels with a fall exceeding 1.5 m.</p>	<p>Surface water sources/ drains/ Lake/ Ponds/ Tanks etc.</p> <p>Pond (4/800 to 4/900) and Rayanpura Tank / Pond (9/300 to 9/500)</p>	MoRTH: 306;	Contractor	Supervision Consultant; KRDC
2.1.3.3	Slope Protection and Control of Soil Erosion	<p>The contractor shall construct slope protection works as per design, or as directed by the Engineer - Incharge of CSC to control soil erosion and sedimentation through use of dykes, sedimentation chambers, basins, fiber mats, mulches, grasses, slope drains and other devices as required under specific local conditions.</p> <p>Contractor shall ensure the following:</p> <ul style="list-style-type: none"> <li>After construction of road embankment, the side slopes of all cut and fill areas shall be graded</li> </ul>	<p>High raise embankment and surface water bodies locations</p> <p>Pond (4/800 to 4/900) and Rayanpura Tank / Pond (9/300 to 9/500)</p>	MoRTH: 305.2.2.2; MoRTH: 306.2; Guideline for Slope Stability and Erosion Control	Contractor	Supervision Consultant; KRDC

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>and covered with stone pitching, grass and shrub as per design specifications.</p> <ul style="list-style-type: none"> <li>• Terfing works shall be taken up as soon as possible provided the season is favorable for the establishment of grass sods.</li> <li>• Other measures of slope stabilization shall include mulching netting and seeding of batters and drains immediately on completion of earthworks with sowing of seeds of grass, shrub and bushes 30cm interval from line to line across the slope and sprinkling of water on such slopes after completion of the earth work.</li> <li>• In borrow pits, the depth shall be regulated so that the sides of the excavation shall not be steeper than 1 vertical to 2 horizontal, from the edge of the bank.</li> <li>• Stabilization of the embankment with appropriate technique/s shall commence soon after the embankment formation.</li> </ul>				
<b>2.1.4</b>	<b>Pollution Control</b>					
<b>2.1.4.1</b>	<b>Water Pollution</b>					
<b>2.1.4.1.1</b>	Water Pollution from Construction Wastes	<p>The Contractor shall take all precautionary measures to prevent the wastewater generated during construction from entering into water bodies or the irrigation system. Contractor shall avoid construction works close to the water bodies during monsoon.</p> <p>All waste arising from the project are to be disposed off in the manner that is acceptable to the State Pollution Control</p>	<p>Surface water sources/ drains/ Lake/ Ponds/ Tanks etc.</p> <p>Unkal Lake (3/300), Pond (4/800 to 4/900) and Rayanpura Tank / Pond (9/300 to 9/500)</p>	<p>MoRTH: 111.4; MoRTH: 111.1; Water Act, 1974</p>	Contractor	Supervision Consultant; KRDC, KSPCB

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		Board or as directed by Engineer – Incharge of CSC. The Engineer – Incharge shall certify that all liquid wastes disposed off from the sites meet the discharge standards.				
<b>2.1.4.1.2</b>	Water Pollution from Fuel, Lubricants and Chemicals	<p>Contractor shall ensure that all vehicle/machinery and equipment operation, maintenance and refueling shall be carried out in such a fashion that spillage of fuels and lubricants does not contaminate the ground. Oil interceptors shall be provided for vehicle parking, wash down and refueling areas as per the design provided.</p> <p>In all, fuel storage and refueling areas, if located on agricultural land or areas supporting vegetation, the top soil shall be stripped, stockpiled and returned after cessation of such storage.</p> <p>Contractor shall arrange for collection, storing and disposal of oily wastes to the pre-identified disposal sites approved by the Engineer – Incharge. All spills and collected petroleum products shall be disposed off in accordance with MoEF and KSPCB guidelines.</p> <p>Engineer – Incharge shall certify that all arrangements comply with the guidelines of KSPCB/ MoEF or any other relevant laws.</p>	<p>Surface water sources/ drains/ Lake/ Ponds/ Tanks etc.</p> <p>Unkal Lake (3/300), Pond (4/800 to 4/900) and Rayanpura Tank / Pond (9/300 to 9/500)</p>	<p>MoRTH: 111.4; MoRTH: 111.1;</p> <p>Petroleum Act and Rules; MoEF/CPCB Notifications;</p> <p>Guideline -2 for Construction Camps</p>	Contractor	Supervision Consultant; KRDCCL, KSPCB
<b>2.1.4.2</b>	<b>Air Pollution</b>					
<b>2.1.4.2.1</b>	Dust Pollution	The contractor shall take every precaution to reduce the level of dust (SPM and RSPM) from crushers, material storage yards, haul roads and construction sites (including earthwork, dismantling, scarification and material	Construction area/ site, Construction camps, Materials Loading / unloading facilities	MoRTH:111.1; MoRTH:111.5; MoRTH:111.9; MoRTH:111.10; Air Act; SPCB Rules and	Contractor	Supervision Consultant; KRDCCL, KSPCB

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>mixing sites) by sprinkling of water, mist spray, encapsulation of dust source and erection of screen /barriers.</p> <p>Hot mix plant and batch mix plant shall be fitted with dust extraction units and mist spray to keep down the dust emission levels. The suspended particulate matter value from a unit (Hot mix, batching and crusher plant) located at a distance of 40m should be less than 500 µg/m<sup>3</sup>.</p> <p>The contractor shall provide necessary certificates to confirm that all crushers used in the project conform to relevant dust emission control legislation. Air pollution monitoring shall be conducted as per the Pollution Monitoring Plan and results shall be used to strengthen/rectify problematic areas. If other existing crushers are used, such units need to have valid license from the KSPCB.</p>		Guidelines		
<b>2.1.4.2.2</b>	Emission from Construction Vehicles, Equipment and Machineries	<p>Contractor shall ensure that all vehicles, equipment and machinery used for construction are regularly maintained and confirm to the emission standards specified by the CPCB. Certification issued for such contrivances obtained from designated/approved authority shall be submitted along with the specified reporting format.</p> <p>The contractor shall maintain a separate file and submit PUC certificates for all vehicles/equipment/machinery used for the project. Monitoring results shall also be submitted to CSC and KRDCCL as per the Pollution Monitoring Plan in the specified format.</p>	Construction camps, Materials Loading / unloading facilities	<p>Motor Vehicles Act</p> <p>Pollution Monitoring Format - Format EC1</p>	Contractor	Supervision Consultant; KRDCCL, KSPCB
<b>2.1.4.3</b>	<b>Noise Pollution</b>					

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
2.1.4.3.1	Noise Pollution: Noise from Vehicles, Plants and Equipment's	The Contractor shall confirm the following: <ul style="list-style-type: none"> <li>All plants and equipment used in construction shall strictly conform to the MoEF/ CPCB noise standards.</li> <li>All vehicles and equipment used in construction shall be fitted with exhaust silencers.</li> <li>Servicing of all construction vehicles and machinery shall be done regularly and during routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found defective shall be replaced.</li> <li>Limits for construction equipment used in the project such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB (A) (measured at one meter distance from the edge of equipment in the free field), as specified in the Environment (Protection) rules, 1986.</li> <li>Maintenance of vehicles, equipment and machinery shall be regular and up to the satisfaction of the Engineer to keep noise levels at the minimum.</li> <li>Idling of temporary trucks or other equipment shall not be permitted during periods of unloading or when they are not in active use. (MoRTH -</li> </ul>	Sensitive locations: <p>Govt Training Institute &amp; Womens Poly Technique (0/500)</p> <p>KLE Society (Jagadguru Gangadhar college of Commerce) (0/740)</p> <p>KLE Society (College of Pharmacy, PC Jabian College, SK&amp; SKS Arts and Science College &amp; BV Bhoomaraddi Engineering College) (1/460)</p> <p>Chetana College (2/850)</p> <p>SANA Institute (5/620)</p> <p>Cancer Hospital (7/120)</p> <p>SDM Dental College (12/700)</p> <p>SDM Medical College (10/920)</p>	Noise rules, 2002 <sup>3</sup>	Contractor	Supervision Consultant; KRDCCL; KSPCB, <p>Affected Communities; PRIs; NGOs; Staff at Schools and Health Centres</p>

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
Section: 201.2)						
		At the construction sites within 150 m of the nearest habitation, noisy construction work such as crushing, concrete mixing, batching shall be stopped during the night time between 9.00 pm to 6.00 am.				
		Noisy construction activities shall not be permitted around educational institutes/health centers (silence zones) up to a distance of 100 m between 9.00 am to 6.00 pm.				
		Contractor shall provide noise barriers to the suggested locations of select schools/ Temples/health centers. List of locations for noise barriers is given in corridor specific EMP.				
		Monitoring shall be carried out at the construction sites as per the monitoring schedule and results shall be submitted to Engineer-Incharge of CSC. Engineer shall be required to inspect regularly to ensure the compliance of EMP. (Refer MoRTH - Section 111.3)				
<b>2.1.4.4</b>	<b>Safety</b>					
<b>2.1.4.4.1</b>	Safety Procedures	The Contractor shall: <ul style="list-style-type: none"> <li>Comply with all applicable safety regulations,</li> <li>Take care for the safety of all persons entitled to be on the site,</li> <li>use reasonable efforts to keep the site and works clear of unnecessary obstruction so as to avoid danger to these persons,</li> <li>provide fencing, lighting, guarding and watching of the works until</li> </ul>	All construction sites		Contractor	Supervision Consultant; SPV

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>completion and taking over and provide any temporary works (including roadways, footways, guards and fences) which may be necessary, because of the execution of the works, for the use and protection of the public and of owners and occupiers of adjacent land</p> <ul style="list-style-type: none"> <li>• A construction safety checklist has been included in the reporting format EM-7</li> </ul>				
2.1.4.4.2	Care and Supply of Documents	<ul style="list-style-type: none"> <li>• The Contractor shall prepare, submit and obtain approval of the Engineer for Construction Safety Management Plan 14 days prior to commencement of Construction Works at site.</li> </ul>	All construction sites		Contractor	Supervision Consultant; SPV
2.1.4.4.3	Contractor's General Obligations	All design calculations and fabrication drawings for Temporary works (such as form-work, staging, centring, scaffolding, specialized construction, handling and launching equipment and the like) material lists for structural fabrication as well as detailed drawings for templates, and anchorage and temporary support details for pre stressing cables as well as bar bending and cutting schedules for reinforcement, etc., shall be prepared by the Contractor at his own cost and forwarded to the Engineer in advance of actual constructional requirements. The Engineer will check and return the same for the Contractor's use with amendments	All construction sites		Contractor	Supervision Consultant; SPV
2.1.4.4.4	Health and Safety	<ul style="list-style-type: none"> <li>• The Contractor shall at all times take all reasonable precautions to maintain the health and safety of the Contractor's Personnel. In collaboration with local health</li> </ul>	All construction sites and labour camp		Contractor	Supervision Consultant; SPV

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>authorities, the Contractor shall ensure that medical staff, first aid facilities, sick bay and ambulance service are available at all times at the Site</p> <ul style="list-style-type: none"> <li>The Contractor shall appoint an accident prevention officer at the Site, responsible for maintaining safety and protection against accidents. This person shall be qualified for this responsibility, and shall have the authority to issue instructions and take protective measures to prevent accidents. Throughout the execution of the Works, the Contractor shall provide whatever is required by this person to exercise this responsibility and authority.</li> <li>The Contractor shall send, to the Engineer, details of any accident as soon as practicable after its occurrence.</li> <li>The Contractor shall maintain records and make reports concerning health, safety and welfare of persons, and damage to property, as the Engineer may reasonably require.</li> </ul>				
2.1.4.4.5	Personal Safety Measures for Labour, Material handling , Painting etc.	<p>Contractor shall provide all necessary safety appliances such as safety goggles, helmets, safety belts, ear plugs, mask etc. to workers and staff.</p> <ul style="list-style-type: none"> <li>Protective footwear and protective goggles to all workers employed on mixing asphalt materials, cement, lime mortars, concrete etc.</li> <li>Welder's protective eye-shields</li> </ul>	All construction sites	Factories Act, 1948; Building and Other Construction Workers (Regulation of Employment and Conditions of Services) Act, 1996	Contractor	Supervision Consultant; KRDC



Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>to workers engaged in welding works</p> <ul style="list-style-type: none"> <li>• Protective goggles and clothing to workers engaged in stone breaking activities and workers shall be seated at sufficiently safe intervals</li> <li>• Earplugs to workers exposed to loud noise (above 75dB (A)), and workers working in crushing, compaction, or concrete mixing operation.</li> <li>• Adequate safety measures for workers during handling of materials at site are taken up.</li> <li>• The contractor shall comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress.</li> </ul> <p>The contractor shall not employ any person below the age of 14 years for any work and no woman shall be employed for the work of painting with products containing lead in any form.</p> <p>The contractor shall also ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint.</p> <p>Contractor shall provide facemasks to the workers when paint is applied in the form of spray or a surface having dry lead paint is rubbed and scrapped.</p> <p>The Contractor shall mark 'hard hat' and</p>				

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		‘no smoking’ and other ‘high risk’ areas and enforce non-compliance of use of PPE with zero tolerance. These shall be reflected in the Construction Safety Plan to be prepared by the Contractor during mobilization and shall be approved by Engineer.				
2.1.4.4.6	Traffic and Safety & Pedestrian Safety	<p>The contractor shall take all necessary measures for the safety of traffic during construction and shall provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as proposed in the Traffic Control Plan/ Drawings and as required by the Engineer - Incharge for the information and protection of traffic approaching or passing through the section of any existing cross roads.</p> <p>The contractor shall ensure that all signs, barricades, pavement markings are provided as per the MoRTH specifications.</p> <p>The contractor shall take the assistance of the local traffic police before diverting the traffic during the progress of the work. The traffic plan duly prepared by him shall be scrutinized for improvement/ suggestion by the engineer – incharge and the traffic department</p> <p>Pedestrian Safety shall be ensured. Pedestrian circulation shall be demarcated prior to start &amp; unsafe areas shall be cordoned off.</p>	All along the project corridor and all haul roads	MoRTH - Section 112.2 and IRC guidelines	Contractor	Resident Engineer; Bridge Engineers KRDCCL, Traffic Department
2.1.4.4.7	Risk from Electrical Equipment(s)	<p>The Contractor shall take all required precautions to prevent danger from electrical equipment and ensure that -</p> <ul style="list-style-type: none"> <li>No material shall be so stacked</li> </ul>	All construction equipment		Contractor	Supervision Consultant; KRDCCL

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>or placed as to cause danger or inconvenience to any person or the public.</p> <ul style="list-style-type: none"> <li>All necessary fencing and lights shall be provided to protect the public in construction zones.</li> </ul> <p>All machines to be used in the construction shall conform to the relevant Indian Standards (IS) codes, shall be free from patent defect, shall be kept in good working order, shall be regularly inspected and properly maintained as per IS provision and to the satisfaction of the Engineer - Incharge.</p>				
<b>2.1.4.4.8</b>	First Aid	<p>The contractor shall arrange for -</p> <p>A readily available first aid unit including an adequate supply of sterilized dressing materials and appliances as per the Factories Rules in every work zone</p> <p>Availability of suitable transport at all times to take injured or sick person(s) to the nearest hospital</p> <p>Equipment and trained nursing staff at construction camp.</p>	All construction sites and labour camps	Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996	Contractor	Supervision Consultant; KRDC
<b>2.1.4.5</b>	<b>Cultural Property</b>					
<b>2.1.4.5.1</b>	Chance Found Archaeological Property	<p>All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on the site are the property of the Government and shall be dealt with as per provisions of the relevant legislation.</p> <p>The contractor shall take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He shall, immediately upon discovery thereof and before removal acquaint the</p>	Along the project road.	Central and State Laws	Contractor	Supervision Consultant; KRDC, State Archeological Department

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>Engineer-Incharge of such discovery and carry out the CSC's instructions for dealing with the same, waiting which all work shall be stopped.</p> <p>The Engineer shall seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.</p>				
<b>2.1.4.6</b>	<b>Labour Camp Management</b>					
<b>2.1.4.6.1</b>	<p>Location of Construction labour camps:</p> <p>Accommodation</p>	<ul style="list-style-type: none"> <li>The contractor shall provide, if required, erect and maintain necessary (temporary) living accommodation and ancillary facilities during the progress of work for labour to standards and scales approved by the Engineer-Incharge.</li> <li>Contractor shall follow all relevant provisions of the Factories Act, 1948 and the Building &amp; other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction &amp; maintenance of labor camp.</li> <li>Construction camps shall not be proposed within 1000m from the nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community. The location, layout and basic facility provision of each labour camp shall be submitted to Engineer prior to their construction.</li> </ul> <p>The construction shall commence only upon the written approval of the Engineer - Incharge.</p>	Along the project corridor at the location of construction labor camps	<p>Building and the other Construction Workers</p> <p>(Regulation of Employment and Conditions of Service) Act, 1996</p>	Contractor	Supervision Consultant; KRDC
<b>2.1.4.6.2</b>	Potable Water	The Contractor shall construct and maintain all labour accommodation in	Construction labor camps	Building and the other	Contractor	Supervision Consultant; KRDC

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>such a fashion that uncontaminated water is available for drinking, cooking and washing. within the precincts of every workplace in an accessible place, as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996). The contractor shall also guarantee the following:</p> <ul style="list-style-type: none"> <li>• Supply of sufficient quantity of potable water (as per IS) in every workplace/labor camp site at suitable and easily accessible places and regular maintenance of such facilities.</li> <li>• If any water storage tank is provided that shall be kept such that the bottom of the tank is at least 1mt. from the surrounding ground level.</li> <li>• If water is drawn from any existing well, which is within 30mt. proximity of any toilet, drain or other source of pollution, the well shall be disinfected before water is used for drinking.</li> <li>• All such wells shall be entirely covered and provided with a trap door, which will be dust proof and waterproof.</li> <li>• A reliable pump shall be fitted to each covered well. The trap door shall be kept locked and opened only for cleaning or inspection, which will be done at least once in a month.</li> <li>• Testing of water shall be done every month as per parameters prescribed in IS 10500:1991.</li> </ul> <p>Compliance to EMP shall be reported to</p>		<p>Construction Workers</p> <p>(Regulation of Employment and Conditions of Service) Act, 1996</p>		

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		Engineer - Incharge every week. Engineer - Incharge shall inspect the labour camp periodically, to ensure compliance of the EMP.				
2.1.4.6.3	Sanitation and Sewage System	<p>The contractor shall ensure that -</p> <ul style="list-style-type: none"> <li>The sewage system for the camp are designed, built and operated in such a fashion that no health hazards occurs and no pollution to the air, ground water or adjacent water courses take place</li> <li>Separate toilets/bathrooms, wherever required, screened from those from men (marked in vernacular) are to be provided for women</li> <li>Adequate water supply is to be provided in all toilets and urinals</li> <li>All toilets in workplaces are with dry-earth system (receptacles) which are to be cleaned and kept in a strict sanitary condition</li> <li>Night soil is to be disposed off by putting layer of it at the bottom of a permanent tank prepared for the purpose and covered with 15 cm. layer of waste or refuse and then covered with a layer of earth for a fortnight.</li> </ul> <p>Adequate health care is to be provided for the work force during the entire phase.</p>	Construction labor camps	<p>Building and the other Construction Workers</p> <p>(Regulation of Employment and Conditions of Service) Act, 1996</p>	Contractor	Supervision Consultant; KRDCCL
2.1.4.6.4	Waste Disposal	The contractor shall provide garbage bins in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner as per the Comprehensive Solid Waste Management Plan approved by the Engineer - Incharge. Unless otherwise arranged by local sanitary authority. The	Construction labor camps	Environment Protection Act, 1986 and Rules	Contractor	Supervision Consultant; KRDCCL, KSPCB, Local Authorities

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		contractor has to make arrangements for disposal of night soils (human excreta) either by suitably approved by the local medical health or municipal authorities or as directed by Engineer - Incharge as provided by the contractor.				
2.1.4.6.5	Stock-yards	Location for stockyards for construction materials shall be identified at least 1000 m from water course and separated and sufficiently away from the labour camps.	Construction labor camps	MoRTH - Section 306	Contractor	Supervision Consultant; KRDC, KSPCB, Local Authorities
		Separate enclosures shall be planned for storing construction materials containing fine particles such that sediment-laden water does not drain into nearby storm water drain & underground sewerage pipes.				
2.1.4.6.6	Fuel storage and refueling areas	The contractor shall ensure that all construction vehicle parking location, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance and refueling sites are located at least 500 m from rivers and irrigation canal/ponds  All location and lay-out plans of such sites shall be submitted by the Contractor prior to their establishment and shall be approved by the Engineer.  In all fuel storage and refueling areas, if located on agriculture land or areas supporting vegetation, the topsoil shall be stripped, stockpiled and returned after completion of such storage and refueling activities. Fuel storage shall be provided with bunds.  The plan for the construction camp site shall also include the process of	Construction labor camps		Contractor	Supervision Consultant; KRDC, KSPCB, Local Authorities

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		collection and disposal of spent oil and grease. The collection and disposal methods for the spent oil and grease submitted as part of the construction camp plan should be duly approved by the Engineer - Incharge.				
<b>2.2</b>	<b>Contractor Demobilization</b>					
<b>2.2.1</b>	Clearing of Construction of Camps & Restoration	Contractor to prepare site restoration plans for approval by the Engineer. The plan has to be implemented by the contractor prior to demobilization.  On completion of the works, all temporary structures shall be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the Engineer.  Residual topsoil shall be distributed on adjoining/proximate barren/rocky areas as identified by the Engineer in a layer of thickness of 75mm - 150mm.	All Construction Workers' Camps		Contractor; Resident Engineer of SC; Environment Officer of SC	KRDCL
<b>2.2.2</b>	Redevelopment of Borrow Areas	Redevelopment of borrow areas shall be taken up in accordance with the plans approved by the Engineer.	At all borrow area locations suggested for the project.		Contractor; Resident Engineer of SC; Environment Officer of SC	KRDCL
<b>3.0</b>	<b>Environmental enhancement and special issues</b>					
<b>3.1</b>	Enhancement measures	Enhancement of all incidental spaces shall be planned and carried out prior to completion of construction, along the project road. Some of the enhancement measures to be considered along the project roads include Avenue tree plantation along the entire stretch of the road, Planting of shrubs in medians, rain water harvesting, adequate storm water drainage , Landscaping at junctions to improve aesthetics etc.	At suitable locations along the project road		KRDCL; DPR consultants; Forest Department; Supervision Consultant	KRDCL



Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
3.2	Road side Plantation Strategy, Tree Planting & Protection	<p>A total of 1750 trees would be cut along BRTS corridor for the purpose of the project and as a compensatory measure, afforestation shall be taken care by the Forest department</p> <p>The forest department (where specifically identified) shall do the plantation measures. Minimum 80 percent survival rate of the saplings shall be planted. The forest department shall maintain the plantation till they handover the project site to KRDCCL.</p> <ul style="list-style-type: none"> <li>• Giving due protection to the trees that fall in the shoulders /corridor of impact shall be the prime focus during Construction/post construction.</li> <li>• Re-plantation of at least twice the number of trees cut should be carried out along the project road. Since the major portion of the project road may pass through open lands, planting of trees along the entire stretch of the road is recommended as an enhancement measure, which would also serve as a mechanism to delineate ROW and prevent future encroachments / squatters into the right of way, wherever possible.</li> <li>• <b>Growth and survival of trees planted shall be ensured and monitoring done at least for a period of 3 years</b> .Survival status shall be reported on monthly basis to Engineer - Incharge.</li> </ul> <p>The Engineer - Incharge shall inspect regularly the survival rate of the plants</p>	<p>All tree plantation / greenery areas of the project;</p> <p>At locations identified along the project road</p>	<p>KRDCL; DPR consultants; Forest Department; Supervision Consultant</p>	<p>KRDCL</p>	

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility		
					Planning and Execution	Supervision and Monitoring	
3.3	Flora and Chance found Fauna	<p>and compliance of tree plantation guidelines.</p> <p>The contractor shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any flora (plant/vegetation) and fauna (animal) including fishing in any water body and hunting of any animal.</p> <p>If any wild animal is found near the construction site at any point of time, the contractor shall immediately upon discovery thereof acquaint the Engineer - Incharge and execute the Engineer's instructions for dealing with the same.</p> <p>The Engineer-Incharge shall report to the nearby forest office (range office or divisional office) and shall take appropriate steps/ measures, if required in consultation with the forest officials.</p>	Along the project road		Contractor; Supervision Consultant	KRDCL; Consultant; Forest Dept., GoK	Supervision
3.4	Sensitive Areas	<p>The sensitive areas like Schools, hospitals are provided with permanent noise barriers prior to the start of work in order to minimize the dust and noise impacts due to vehicle movement (during / post construction). Their effectiveness to be checked during operation phase.</p> <p>Construction activities shall be confined within the present available RoW, regularly strict monitoring/ supervision should be done to minimize/control air-noise pollution and abatement of dust particles at minimum level possible using well maintain modern machineries.</p> <p>Environmental monitoring suggested in the <b>Chapter 4 (implementation arrangement)</b> shall be strictly adopted</p>	<p>Sensitive locations:</p> <p>Govt Training Institute &amp; Womens Poly Technique (0/500)</p> <p>KLE Society (Jagadguru Gangadhar college of Commerce) (0/740)</p> <p>KLE Society (College of Pharmacy, PC Jabian College, SK&amp; SKS Arts and Science College &amp; BV Bhoomaraddi Engineering College) (1/460)</p>		Contractor; Supervision Consultant		KRDCL

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		while conducting air, noise, water and soil monitoring. Apart from the suggested monitoring locations, environmental monitoring shall be carried out for additional locations suggested by the Engineer-In-charge during the implementation phase.	Chetana College (2/850) SANA Institute (5/620) Cancer Hospital (7/120) SDM Dental College (12/700) SDM Medical College (10/920)			
<b>4.0</b>	<b>OPERATION STAGE (Activities to be Carried Out by the KRDCL/Forest Department, GoK )</b>					
<b>4.1</b>	Monitoring and Evaluation of Operational Performance of Environmental Mitigation Measures provided in the Project	The KRDCL shall monitor the operational performance of the various mitigation/ enhancement measures carried out as a part of the project. Monitoring and performance indicators have been indicated in <b>Chapter 4 (section 4.1 Environmental Monitoring Plan)</b> .  Also, the rehabilitation works at degraded sites along surface water bodies and gullies after soil and water conservation measures has to be inspected, recorded and damages timely repaired for effective functioning and maintenance of such efforts in the field. All observations and data shall be added /updated in the Database/Information Management System developed for the project. This also covers other points given in this table.	All along the project corridor	-	KRDCL	KRDCL
<b>4.2</b>	Maintenance of Drainage	KRDCL shall ensure that all drains (side drains and all cross drainages) are periodically cleared especially before monsoon season to facilitate the quick passage of rainwater and avoid flooding without damaging the spurs and check dams erected to stabilize the course and	All along the project corridor	MoRTH specifications; IRC guidelines	KRDCL	KRDCL

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		flow of all such drainage channels.				
		KRDCL shall ensure that all the sediment/oil and grease traps set up at the truck and bus lay bye are cleared once in every three months.				
4.3	Pollution Monitoring	The periodic monitoring of the ambient air quality, noise level, water (both ground and surface water) quality, soil pollution/contamination are to be continued at pre-designated locations as identified in the Pollution Monitoring Plan and if necessary, at additional locations for comparative study of pre and post operation data in order to ensure further improvement/modification in similar future works.	All along the project corridor	Environmental Monitoring Plan (section 4.1)	KRDCL; KSPCB	KRDCL; KSPCB
		KRDCL shall appoint specific pollution monitoring agency for this purpose.				
4.3	Atmospheric Pollution/ air pollution	Ambient air concentrations of various pollutants shall be monitored as envisaged in the Environmental Monitoring Plan at pre designated locations to compare the levels with the pre-construction data.	All along the project corridor	Environmental Monitoring Plan (section 4.1)	KRDCL; KSPCB	KRDCL; KSPCB
		Additional data at other location may be collected as per any site specific requirement.				
4.4	Noise Pollution	Noise pollution shall be monitored as per environmental monitoring plan at sensitive locations where pre-construction noise data was collected. The functioning of the noise barriers has to be specifically supervised and monitored for further improvement/replication at other affected points if necessary.	All along the project corridor	Environmental Monitoring Plan (section 4.1)	KRDCL; KSPCB	KRDCL; KSPCB

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		Signage indicating 'no horn zones' near sensitive locations shall be maintained and kept clean. Monitoring the effectiveness of the pollution attenuation barriers shall be taken up thrice in the operation period.				
4.5	Soil Erosion and Monitoring of Borrow Areas	Visual monitoring and inspection of soil erosion at borrow areas, quarries (if closed and rehabilitated), embankments and other places expected to be affected, shall be carried out before monsoon, during monsoon and after winter rains to record and monitor the effectiveness of such structures after the completion of project, so as to evaluate the beneficial effects of each type of activity together with the cost involved.	Borrow areas	Guideline – 3 for Borrow Area Management ( <b>Annexure - 4</b> )	KRDCL	KRDCL
4.6	Road Safety and Maintenance of Assets	<p>Along the BRT corridor, pedestrian crossing shall be spaced at 200mts. This will provide a comfortable access across the BRT corridor, avoiding public hopping across median railings</p> <p>The bus stops shall be designed to provide at grade boarding and alighting. This provides fast and safe transfers, thus reducing boarding and alighting time.</p> <p>Pedestrians crossing shall be raised to the level of pedestrian paths to provide at grade crossing as well as to reduce the speed of the vehicles</p> <p>Provision of adequate cautionary, mandatory and regulatory signage is necessary for the safety of the pedestrians</p> <p>Pelican signals shall be provided for the pedestrians at the pedestrian crossing, providing not only priority to the</p>	All along the project corridor	-	KRDCL	KRDCL

Sl. No	Activities	Management Measure	Location	Reference <sup>3</sup>	Responsibility	
					Planning and Execution	Supervision and Monitoring
		<p>pedestrians but also increasing safety of the pedestrians</p> <p>On the locations where the pedestrian crossing at grade is neither safe nor a viable option, feet over bridges (a total of 7 FOB's are proposed along the BRT corridor) shall be proposed</p> <p>Critical junctions like Jubilee circle, Rani Chenamma etc. are designed to reduce congestion and provide a continuous signalized pedestrian crossing</p> <p>Well lit pathways shall be provided for safer and comfortable walk. Adequate street lighting shall be provided for the pedestrian pathway</p>				

## 4. IMPLEMENTATION ARRANGEMENTS

27. Effective implementation of the environmental measures suggested based on the baseline environmental conditions and environmental impact assessment requires robust procedures. Implementation could be ensured only when a pragmatic approach for environmental management is adopted. This chapter provides the necessary tools and approaches for ensuring effective implementation.

### 4.1 Environmental Monitoring Plan

28. The monitoring programme is devised to ensure that the envisaged purpose of the project is achieved and results in the desired benefit to the target population. To ensure the effective implementation of the EMP, it is essential that an effective monitoring programme be designed and carried out. Broad objectives of the monitoring programme are:

- To evaluate the performance of mitigation measures proposed in the EMP
- To suggest improvements in the management plans, if required
- To satisfy the statutory and community obligations
- To provide feedback on adequacy of Environmental Impact Assessment

#### 4.1.1 Monitoring Indicators

29. The monitoring programme contains monitoring plan for all performance indicators, reporting formats and necessary budgetary provisions. Physical, biological and environmental management components identified as of particular significance in affecting the environment at critical locations have been suggested as Performance Indicators (PIs). The Performance Indicators shall be evaluated under three heads as:

- Environmental condition indicators to determine efficacy of environmental management measures in control of air, noise, water and soil pollution;
- Environmental management indicators to determine compliance with the suggested environmental management measures.

30. Operational performance indicators have also been devised to determine efficacy and utility of the mitigation/enhancement designs proposed.

**Table 4-1: Environmental Monitoring Indicators**

Sl. No.	Indicator	Details	Stage	Responsibility
<b>A Environmental Condition Indicators and Monitoring Plan</b>				
1	Air Quality	The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored will be as per the Monitoring Plan prepared (Refer Table 4-2)	Construction	Contractor under the monitoring of KRDCL through approved monitoring agency
			Operation	
			Pre-Construction	
2	Noise Levels	The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored will be as per the Monitoring Plan prepared (Refer Table 4-2)	Construction	Contractor under the monitoring of KRDCL through approved monitoring agency
			Operation	
			Pre-Construction	

Sl. No.	Indicator	Details	Stage	Responsibility
3	Water Quality		Construction Operation Pre-Construction	Contractor under the monitoring of KRDCCL KRDCCL through approved monitoring agency KRDCCL through approved monitoring agency
4	Soil Quality		Construction Operation	Contractor under the monitoring of KRDCCL KRDCCL through approved monitoring agency
<b>B Environmental Management Indicators and Monitoring Plan</b>				
1	Construction Camps	Location of construction camps have to be identified and parameters indicative of environment in the area has to be reported	Pre-construction	KRDCL
2	Borrow Areas	Location of borrow areas have to be identified and parameters indicative of environment in the area has to be reported.	Pre-construction	KRDCL
3	Tree Cutting	Progress of tree removal marked for cutting is to be reported	Pre-construction	Forest Department to KRDCCL
4	Tree Plantation	Progress of measures suggested as part of the Strategy is to be reported	Construction	Forest Department
<b>C Management &amp; Operational Performance Indicators</b>				
1	Survival Rate of Trees	The number of trees surviving during each visit will be compared with the number of saplings planted	Operation	Forest Department/ KRDCCL
2	Status Regarding Rehabilitation of Borrow Areas	The PU will undertake site visits to determine how many borrow areas have been rehabilitated in line with the landowner's request and to their full satisfaction.	Operation	The KRDCCL will be responsible for a period of three years.
3	Soil Erosion	Visual monitoring and operation inspection of embankments will be carried out once in three months.	Operation	The KRDCCL will be responsible for a period of three years.

31. For each of the environmental condition indicator, the monitoring plan specifies the parameters to be monitored; location of the monitoring sites; frequency and duration of monitoring. The monitoring plan also specifies the applicable standards, implementation and supervising responsibilities. The monitoring plan for environmental condition indicators of the project in construction and operation stages is presented in **Table 4-2**.



**Table 4-2: Environmental Monitoring Plan**

Attribute	Project Stage	Parameter	Special Guidance	Standards	Frequency	Duration	Location	Implementation
<b>Air</b>	Construction	SO <sub>2</sub> , NO <sub>x</sub> , RPM, SPM, O <sub>3</sub> , Pb, CO, NH <sub>3</sub> , C <sub>6</sub> H <sub>6</sub> , BaP, As and Ni	High volume sampler to be located 50m from the plant in the Downwind direction. Use method specified by CPCB for analysis	Air (prevention and Control of Pollution) Rules, CPCB, 2009	Three seasons per year	24 hours Sampling	Along the road, Hot mix / batching plant and additional locations as suggested by Engineer-In charge	Contractor / KRDCCL
	Operation <sup>4</sup>				Continuous monitoring (Three seasons in a year)		Along the road at sensitive locations	Contractor / KRDCCL
<b>Water</b>	Construction	All essential characteristics and some of desirable characteristics as decided by the Environmental Specialist of the CSC and KRDCCL	Grab sample collected from source and Analyse as per Standard Methods for Examination of Water and Wastewater	Indian Standards for Inland Surface Waters (IS: 2296, 1982)	Four seasons per year	Grab Sampling	Along the road at Surface water sources	Contractor / KRDCCL
	Operation				Continuous monitoring (Four seasons in a years )		Along the road at surface water sources	Contractor / KRDCCL
<b>Noise</b>	Construction	Noise levels on dB (A) scale	Equivalent noise levels using an integrated noise level meter kept at a distance of 15 from edge of pavement Equivalent noise levels using an integrated noise level meter kept at a distance of 15 from edge of pavement	MoEF Noise Rules, 2000	Three seasons per year	Leq in dB(A) of day time and night time	Along the road, Hot mix / batching plant and additional locations as suggested by Engineer-In charge	Contractor / KRDCCL
	Operation				Continuous monitoring (Three seasons per year).		Along the road at sensitive locations	Contractor / KRDCCL
<b>Soil</b>	Construction	Monitoring of Pb, SAR and Oil & Grease	Sample of soil collected to acidified and analysed using absorption Spectrophotometer	Threshold for each contaminant set by IRIS database of USEPA until national standards are promulgated	Four seasons per year	Grab Sampling	Along the road, Hot mix / batching plant and additional locations as suggested by Engineer-In charge	Contractor / KRDCCL

<sup>4</sup> Parameters to be monitored for Operation stage is same as Construction stage

	Operation					Continuous monitoring (Four seasons per year)		Along the road at sensitive locations	Contractor / KRDCL
<b>Borrow area</b>	Construction	As per Guidelines	Visual Observation	-		Once in a month	-	Borrow area location	Contractor
<b>Tree plantation</b>	Operation stage	As per Design				Continuous monitoring (Quarterly)	-	Areas where plantation is being done	Contractor / KRDCL
<b>Health and Safety</b>	Construction	As per World Bank EHS Guidelines	-		Environmental, Health and Safety (EHS) standards	Quarterly	-	Construction and Labour Camp sites	Contractor / KRDCL

## 4.2 Reporting System

32. Reporting system for the suggested monitoring program operates at two levels as:
- Reporting for environmental condition indicators and environmental management indicators (except tree cutting indicator)
  - Reporting for operational performance indicators at the KRDCCL level
33. Contractor and Engineer operate the reporting system for environmental condition and environmental management indicators (except tree cutting). The Environmental Cell of KRDCCL will operate the reporting system for environmental management tree cutting indicator and operation performance indicators. The KRDCCL will set the targets for each activity envisaged in the EMP beforehand and all reports will be against these targets.
34. Contractor will report to the Engineer on the progress of the implementation of environmental conditions and management measures as per the monitoring plans. The Engineer will in turn report to the KRDCCL on a quarterly basis which will be reviewed. Along with these reports, Environmental Cell of the KRDCCL shall report progress of tree cutting, compensatory plantation, landscaping and survival rate as per the monitoring plan. Reporting formats have been prepared, which will form the basis of monitoring, by the Engineer and/or the Environmental Cell as required and presented as **Annexure-2**.

**Table 4-3: Summary details of Reporting**

Format No.	Item	Stage	Contractor	Supervision Consultant (SC) / Concessionaire		Project Implementation Unit (KRDCCL)
				Implementation & Reporting to SC	Supervision	
EM1	Identification of Disposal Locations	Pre-Construction	One Time	One Time	One Time	One Time
EM2	Setting up of Construction Camp	Pre-Construction	One Time	One Time	One Time	One Time
EM3	Borrow Area Identification	Pre-Construction	One Time	One Time	One Time	One Time
EM4	Tree Cutting	Pre-Construction	-	-	-	Quarterly
EM5	Tree Plantation	Construction	-	-	-	Quarterly
EM6	Top Soil Monitoring	Construction	Quarterly	Continuous	Quarterly	Quarterly
EM7	Construction Safety	Construction	Quarterly	Continuous	Quarterly	Quarterly
EC1	Pollution Monitoring	Construction	As Per Monitoring Plan	Quarterly	Quarterly	Quarterly
EC2	Pollution Monitoring	Operation	-	-	-	As Per Monitoring Plan
OP1	Survival Rate of Trees	Operation	-	-	-	Quarterly
OP2	Status Regarding Rehabilitation of Borrow Areas	Operation	-	-	-	Half Yearly

35. In addition to these formats, to ensure that the environmental provisions are included at every activity of the implementation by the contractor, it is suggested that the approval of the environmental personnel of the engineer is required in the request for application to proceed or other similar reporting formats used by the contractor. These will not only ensure that the environmental provisions are addressed but also link the satisfactory compliance to environmental procedures prior to approval of the Interim Payment Certificate (IPC) by the

Engineer. The activities by the contractor that can impact the environment will be identified based on discussions between the Environmental Specialist of the KRDCCL, team leader of the Engineer and the Environmental personnel of the Engineer. The decisions will be communicated to the contractor prior to the start of the construction activities.

### 4.3 Environmental Audit

36. The Hubli-Dharwad BRTS Company would get an Environmental Audit conducted at the end of each year of implementation of project to assess the status of implementation of Environmental management plans, identify constraints, if any during implementation, document best practices, if any and suggest measures for effective implementation and monitoring. The draft ToR is in **Annexure 3**.

### 4.4 Institutional Setup

37. The Environmental Management Plan, EMP process does not stop once a project (planning and design) has obtained approval for implementation. During implementation of project, Construction Supervision Consultant (CSC) and Contractor will be responsible for ensuring that the environmental commitments made to regulatory agencies, lending agencies and other stakeholders during the EIA process are met. To execute EMP is a combined responsibility of all three parties involved i.e. KRDCCL and CSC indicative responsibility mechanism has been presented in in **Table 4-4**, as developed for upgradation projects.

**Table 4-4:** Institutional Responsibilities

System	Designation	Responsibilities
<b>Coordinating/Facilitating Agency</b>	Managing Director (SPV/KRDCL)	<ul style="list-style-type: none"> <li>• Overview of the project implementation</li> <li>• Ensure timely budget for the EMP</li> <li>• Coordination with different state level committee, to obtain Regulatory Clearances</li> <li>• Participate in state level meetings</li> <li>• Monthly review of the progress.</li> </ul>
	Project Manager (SPV/KRDCL)	<ul style="list-style-type: none"> <li>• Overall responsible for EMP implementation</li> <li>• Reporting to various stakeholders (World Bank, Regulatory bodies) on status of EMP implementation</li> <li>• Coordination with SPV/KRDCL Staff (Environmental officer).</li> <li>• Responsible for obtaining Regulatory Clearances</li> <li>• Review of the progress made by contractors</li> <li>• Ensure that BOQ items mentioned in EMP are executed as per Contract provisions.</li> </ul>
	Environmental Officer (SPV/KRDCL)	<ul style="list-style-type: none"> <li>• Assisting Project Manager in overall implementation of EMP</li> <li>• Review of periodic reports on EMP implementation and advising Project Manager in taking corrective measure.</li> <li>• Conducting periodic field inspection of EMP implementation</li> <li>• Assisting Project Manager to reporting various stakeholders (World Bank, Regulatory bodies) on status of EMP implementation</li> <li>• Preparing environmental training program and conducting the same for field officers and engineers of contractor</li> </ul>
<b>Implementing/ Monitoring Agency</b>	Engineer- Incharge (CSC )	<ul style="list-style-type: none"> <li>• Act as an “Engineer” for supervising EMP implementation</li> <li>• Responsible for maintaining quality of EMP envisioned in Detail Project Report</li> <li>• Maintaining progress reports on EMP implementation</li> </ul>

System	Designation	Responsibilities
		<ul style="list-style-type: none"> <li>• Periodic reporting to SPV/KRDCL about the status of EMP implementation</li> <li>• Work in close coordination with Environmental officer (SPV/KRDCL) and contractor</li> </ul>
<b>Executing Agency</b>	Environmental Manager / Engineer of Contractor	<ul style="list-style-type: none"> <li>• Responsible for ensuring the implementation of EMP as per provision in the document.</li> <li>• Directly reporting to the Project Manager of the Contractor</li> <li>• Discussing various environmental/social issues and environmental/social mitigation, enhancement and monitoring actions with all concerned directly or indirectly</li> <li>• Assisting his project manager to ensure social and environmentally sound and safe construction practices</li> <li>• Conducting periodic environmental and safety training for contractor's engineers, supervisors and workers along with sensitization on social issues that may be arising during the construction stage of the project</li> <li>• Assisting the SPV/KRDCL on various environmental monitoring and control activities including pollution monitoring; and</li> <li>• Preparing and submitting monthly/bio-monthly reports to SPV/KRDCL on status of implementation safeguard measures</li> </ul>

## 4.5 Good Environmental Construction Guidelines

38. Comprehensive environmental construction guidelines have been prepared to guide the planning and implementing agency in preparing the project specific environmental code of conduct for contractor. The list of good environmental practices is as follows. All guidelines listed are presented as **Annexure 4** for reference and implementation into the Environmental Management Plans for the specific projects.

**Table 4-5:** Guideline for Good Environmental Practices

Guidelines	Activities
Guideline-1	Site Preparation
Guideline-2	Construction and Labour Camps
Guideline-3	Borrow Areas
Guideline-4	Topsoil Salvage, Storage and Replacement
Guideline-5	Quarry Management
Guideline-6	Water for Construction
Guideline-7	Slope Stability and Erosion Control
Guideline-8	Waste Management and Debris Disposal
Guideline-9	Water Bodies
Guideline-10	Drainage
Guideline-11	Construction Plants & Equipment Management
Guideline-12	Labour and Worker's Health and Safety
Guideline-13	Cultural Properties
Guideline-14	Tree Cutting and Afforestation
Guideline-15	Forests and Other Natural Habitats
Guideline-16	Air and Noise Pollution
Guideline-17	Environmental Monitoring

## 5. EMP BUDGET

39. Budgetary estimates for environmental management in the project include all items envisaged as part of the EMP. The environment budget includes provisions for various environmental management measures (other than measures considered under good engineering practices) and the environmental monitoring costs. Budgetary provisions for the project are presented in **Table 5-1**.

**Table 5-1:** Budgetary Provisions for Environmental Management Measures

S. No.	Item	Unit	Rate (in INR)	Quantity	Cost (in INR)
<b>A</b>	<b>CONSTRUCTION PHASE</b>				
<b>1</b>	<i>Mitigation Measures</i>				
<b>1.1</b>	Oil Interceptors	Number	5000	8	40,000.00
<b>1.2</b>	Recharge pits	Number	20000	20	400,000.00
<b>1.3</b>	Silt Fencing	Length (m)	900	300	270,000.00
<b>1.4</b>	Deepening of Ponds	Number	250000	3	750,000.00
<b>2</b>	<i>Tree Plantation and Protection</i>				
<b>2.1</b>	Trees	Afforestation is taken care by Forest Department, Karnataka			
<b>2.2</b>	Brick Tree Guards				
<b>3</b>	<i>Monitoring of Environmental Attributes during Construction Activity</i>				
<b>3.1</b>	<i>Air Quality</i>				
<b>3.1.1</b>	Monitoring of Air Quality near Hot mix plants	No. of Samples	6000	54	324,000.00
<b>3.1.2</b>	Monitoring of Air Quality at Critical Locations	No. of Samples	6000	72	432,000.00
<b>3.2</b>	<i>Noise Levels</i>				
<b>3.2.1</b>	Monitoring of Noise Level at Equipment Yards	No. of Samples	4000	54	216,000.00
<b>3.2.2</b>	Monitoring of Noise Levels at Critical Locations	No. of Samples	4000	72	288,000.00
<b>3.3</b>	Water Quality	No. of Samples	6000	96	576000
<b>3.4</b>	Soil Quality	No. of Samples	6000	72	432000
<b>4</b>	<i>Enhancement of Cultural Properties</i>				
<b>4.1</b>	Fully affected	Number	100000	5	500000
<b>5.1</b>	Partially affected	Number	75000	7	525000
	<b>Environmental Budget During Construction Phase</b>				<b>4,753,000.00</b>
<b>B</b>	<b>OPERATION PHASE</b>				
<b>1</b>	<i>Monitoring of Air Quality during Operation Phase</i>				
<b>1.1</b>	Monitoring of Air Quality at Critical Locations	No. of Samples	6000	45	270,000.00
<b>1.2</b>	Monitoring at additional locations	No. of Samples	6000	36	216,000.00
<b>2</b>	<i>Monitoring of Noise during Operation Phase</i>				
<b>2.1</b>	Monitoring of Noise Levels at Critical Locations	No. of Samples	4000	45	180,000.00
<b>2.2</b>	Monitoring at additional locations	No. of Samples	4000	18	72,000.00
<b>3</b>	<i>Monitoring of Management &amp; Operational Performance Indicators</i>				
<b>3.1</b>	Status of Redevelopment of Borrow Areas	No. of trips	5000	5	25,000.00
	<b>Environmental Budget During Operation Phase</b>				<b>763,000.00</b>
	Sub Total (A+B)				5,516,000.00
	<b>Grand Total INR. (Environmental Budget Exclusive of Cost of Measures Included Under Good Engineering Practices, A+B+10% contingency)</b>				<b>6,067,600.00</b>