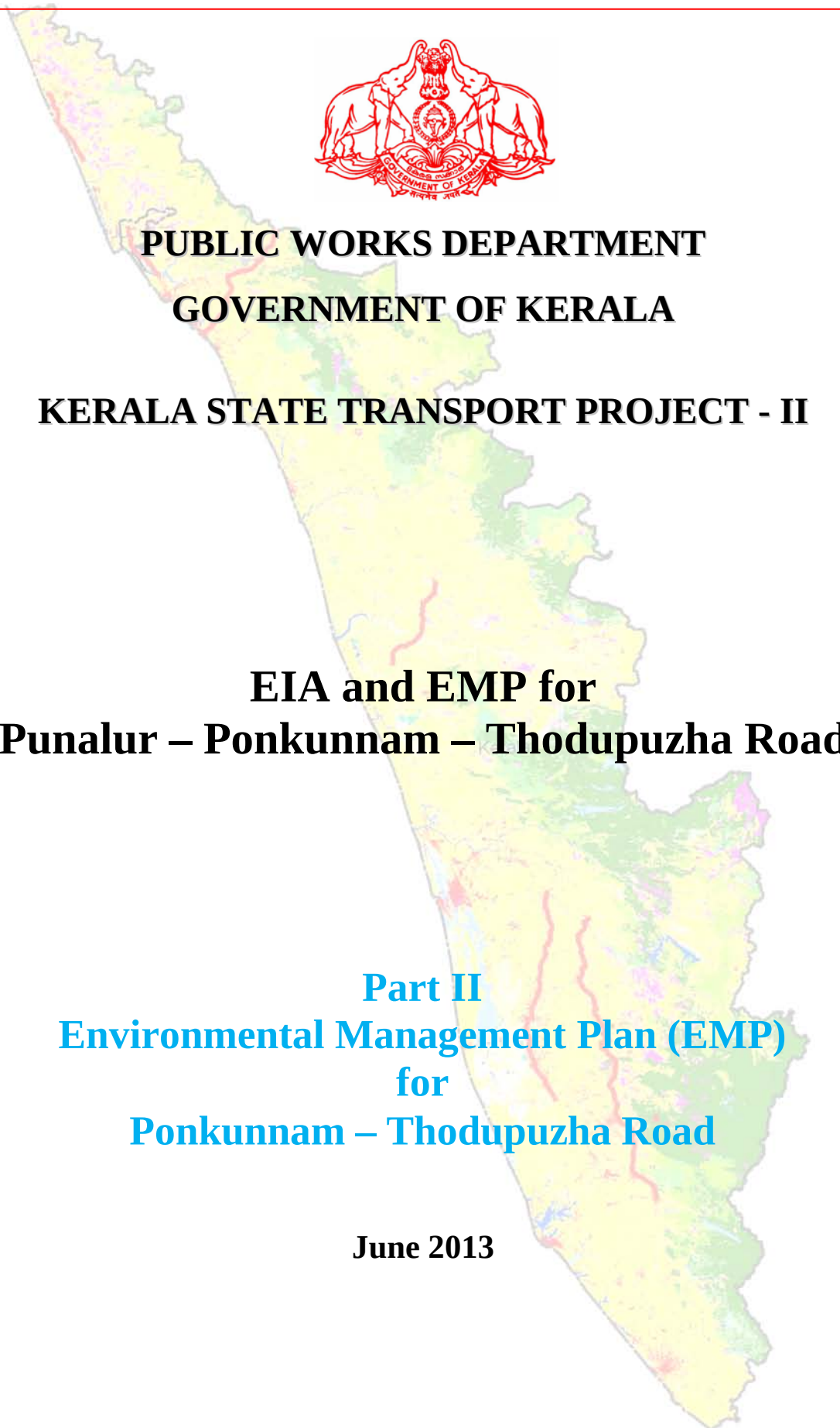

PUBLIC WORKS DEPARTMENT

GOVERNMENT OF KERALA

KERALA STATE TRANSPORT PROJECT - II

EIA and EMP for Punalur – Ponkunnam – Thodupuzha Road

Part II
Environmental Management Plan (EMP) for Ponkunnam – Thodupuzha Road

June 2013

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Chapter 1. Introduction

Government of Kerala (GOK), is implementing KSTP in two stages, KSTP–I was completed by 2011 and KSTP–II has been taken up now. The project is to upgrade critical sections of the State's road network. The Project is supported by the International Bank for Reconstruction and Development (IBRD/World Bank). The KSTP-II project road Punalur – Ponkunnum - Thodupuzha (Link 84) is one of the several road links considered as a part of the 600 km of high priority roads selected after the feasibility study of 87 potential road links. The KSTP-II road improvement component of the project (~330 km) requires World Bank and GOK clearances and approvals before construction can proceed.

An Environmental Management Plan (EMP) has been prepared for the section Ponkunnam - Thodupuzha (Link 84) of length 49.07 km, (Pl refer Figure 2.1) considered in KSTP-II of the 600 km high priority roads to define the Environmental Management requirements to ensure environmental safe guards during construction and operation. Earlier as a first step a Sectoral Environmental Assessment (SEA) was prepared in December 2001 in accordance to the World Bank requirements for the high priority roads. For KSTP-I roads, all clearances have been obtained prior to the approval of the loan application. Among the KSTP-II Roads, this link road doesn't pass through any forest area. hence any forest clearance is not required.

The most important parts of this document are the Generic Environmental Management Action Plan (EMAP) and Link Specific Environmental Management Action Plan (EMAP). The Generic EMAP comprises activity wise impacts and generic mitigation measures identified for each environmental attribute like land, water, air, noise, biological environment social environment and solid waste management. A robust Monitoring and Reporting (M&R) system is in-built into it for various phases of the project and activities. This is supported by annexures, which provides (i) detailed guidelines to enable the Contractor to implement the EMAP in an appropriate manner, (ii) monitoring formats for the Contractor to report to CSC (Construction Supervision Consultant) and (iii) checklists for the CSC to monitor the implementation of EMAP. This has been evolved based on the lessons learned from the review of implementation of EMAP in KSTP-I conducted by Wilbur Smith Associates[1] in June 2012.

The acquisition of land, which has already been identified under earlier design, is almost complete. RAP provides compensation and rehabilitation, for direct (private properties) social impacts, while EMP provides other social impact mitigation and enhancement for direct (public properties) and indirect impacts.

The Link Specific EMAP and its annexures provide link specific and location specific impacts, mitigation measures and enhancement details.

1.1. Environmental Assessment (EA) Process

The EA has been carried out for the entire project and an overview is furnished in the SEA mentioned above. The project /link specific issues are addressed in the Environmental Impact Assessment reports and EMPs. This document addresses the corridor-specific Environmental Management Plan (EMP) for the 49.07 km of Ponkunnum - Thodupuzha road (Link 84) included in the KSTP-II improvement programme. EIA and EMP reports identifies the environmental impacts in the earlier stages of project preparation to incorporate necessary mitigation measures required to minimise those impacts as well as to enhance the positive

[1] Wilbur Smith Associates has been renamed as CDM Smith India Pvt. Ltd. With effect from April 4th , 2013.s

factors. All environmental management/ mitigation costs have been included in the Bill of Quantities (BOQ) Bill No 2 titled 'Site Clearance', Bill No 3 titled 'Earth Work' and Bill No.11 Titled 'Environmental impact mitigation works'. In addition to this an environmental monitoring and training budget is included separately as EMU /PMT[2] costs as project costs.

The project's Social Impact Assessments resulted in the preparation of a Resettlement Action Plan (RAP) for KSTP-II roads to address the land acquisition procedures and all associated social aspects such as compensation, resettlement and relocation. This RAP is currently being implemented by PMT and is soon nearing completion. Similarly the environmental studies has led to the preparation of link specific EMPs.

This document assists the Contractor and associated officials to mitigate or minimize the negative social and environmental impacts due to the construction and operation of the project and to enhance the positive impact of this project. The EMP has been prepared to meet the GOI requirements as specified by the Ministry of Environment and Forest (MoEF) and meeting the requirements of the World Bank. Its purpose is to present an evaluation of potential impacts due to the proposed upgrading and realignment of the existing State Highway from Ponkunnam - Thodupuzha. The document has presented the impacts, mitigation measures and appropriate costs for the proposed mitigation measures. The environmental and social impact mitigation and enhancement details of the proposed action within the Link 84 corridor are presented and evaluated in detail in the remaining part of the document. Institutional strengthening for environmental management is also an essential part of this document for implementing contract provisions and other environmental mitigation and enhancement provisions.

1.2. Objectives of Environmental Management Plan (EMP)

The objectives of the Environmental Management Plan (EMP) are to:

- Define the Environmental management principles and guidelines for the pre-construction, construction and post construction phases of the road improvement.
- Describe the practical mitigation measures that should be implemented on road improvement works and ancillary sites (Quarry and borrow areas) to prevent or mitigate any negative environmental impacts and to enhance the positive issues.
- Establish the roles and responsibilities of all parties involved in the implementation of environmental controls;
- Establish monitoring and reporting system for facilitating aprropriate implementation of EMP.

1.3. Unique Characteristics of Project Location - Kerala

The Contractor may not be from India and will be required to be familiar with the unique characteristics of Kerala State.

Kerala is a vegetation-covered strip of land of 600 km long with an average width of 75 km and a steep slope from the Western Ghats in the East to the Arabian Sea Coast in the West. This steep slope from the Western Ghats at an average height of 800 m above mean sea level to the sea drains the area very quickly during monsoon. During non-monsoon season, scarcity of drinking water is a common problem in many parts of the State.

The unique nature of Kerala can be explained by

[2] The PIU (Project Implementation Unit) of the PWD was re-christened as the PMT (Project Management Team) in April 2002

- High Population Density
- Unique settlement pattern known as 'Urban-Rural Continuum'.
- Steep topography, dense river regimes, and derived hills
- High precipitation
- Rivers, backwaters, lakes and ponds
- Low lying paddy fields
- High-density road network

As in many densely populated areas of the world, the old road system has evolved over the years with very few highways designed for road safety to meet the peculiar mix of pedestrians and vehicles, which they carry.

1.4. Environmental Regulations Applicable to the Project

Summary of environmental clearances/ permits/ approvals required for the project is presented in **Table 1.1**. During the pre-construction stage, the responsibility of obtaining clearances from concerned authority lies with PWD. Those clearances which needs to be obtained during construction phase, but prior to work initiation lies with the Contractor.

Table 1.1. List of Environmental Regulations Applicable to the Project

Sl. No	Type of Clearance	Statutory Authority	Applicability	Project Stage	Responsibility
1.	Tree felling permission	Kerala State Forest Department	Felling of avenue trees	Pre construction	KSTP
2.	Consent to Establish under the Air (Prevention & Control of Pollution) Act, 1981 and The Water (Prevention & Control of Pollution) Act, 1974.	Kerala State Pollution Control Board	For the entire project road	Pre construction	KSTP
3.	Consent to Establish under the Air (Prevention & Control of Pollution) Act, 1981 and The Water (Prevention & Control of Pollution) Act, 1974.	Kerala State Pollution Control Board	For operating hot mix plants, crushers and construction camps	Construction (Prior to work initiation)	Contractor
4.	Consent to Operate under the Air (Prevention & Control of Pollution) Act, 1981 and The Water (Prevention & Control of Pollution) Act, 1974.	Kerala State Pollution Control Board	For operating hot mix plants, crushers and construction camps	Construction (Prior to work initiation)	Contractor
5.	Permission to store Hazardous Materials under Hazardous	Kerala State Pollution Control Board	Storage and Transportation of Hazardous	Construction (Prior to work initiation)	Contractor

Sl. No	Type of Clearance	Statutory Authority	Applicability	Project Stage	Responsibility
	Waste (Management and Handling) Act 1989		Materials and Explosives		
6.	Explosive license under The Explosives Act (& Rules), 1884 (revised in 1983)	Chief Controller of Explosives, petroleum & Explosive Safety Organization	Storage of explosive materials	Construction (Prior to work initiation)	Contractor
7.	PUC for vehicles for construction under Central Motor and Vehicle Act 1988	Motor Vehicle Department of Kerala	For all construction vehicles	Construction (Prior to work initiation)	Contractor
8.	Quarry lease deeds and license under The Mines Act, 1958	Mining and Geology Department of Kerala	Quarrying and borrowing operations	Construction (Prior to work initiation)	Contractor
9.	Extraction of sand from rivers	District level Expert committee under district collector and local govt. body	Extraction of Sand from rivers	Construction (Prior to work initiation)	Contractor
10.	Consent for ground water extraction	Kerala Ground Water Authority	Ground water extraction for construction camps	Construction (Prior to work initiation)	Contractor

1.5. Methodology of Preparing EMP

Much of the environmental degradation that happens during the construction stage of a highway can be prevented or controlled, if there is an appropriate system in place. Hence, this EMAP table has been specifically designed to capture all the impacts that take place during the entire life cycle of a project from design to operation stage. Accordingly, a thorough activity analysis was carried out listing out all the project activities, based on which an impact identification matrix was prepared to understand the impacts upon various environmental parameters such as land, water, air, noise, flora and fauna. Lastly, socio-economic impact upon people and solid waste generation was also considered as separate impacts.

Based on this exercise, a totally new Environmental Management Plan (EMP) has been prepared suggesting various mitigation measures to avoid or minimize the impacts of the project on the environment during the pre-construction, construction and operation phases. Two sets of guidelines were prepared and incorporated in the Generic EMAP table of EMP reports to enable the Contractor to implement the project with least impact upon the environment– (i) Guidelines for entire project stretch including the project facilities like camps and sites and (ii) Guidelines exclusively for siting, management and restoration of project facilities like camps and sites. **Table 1.2** gives the list of these guidelines:

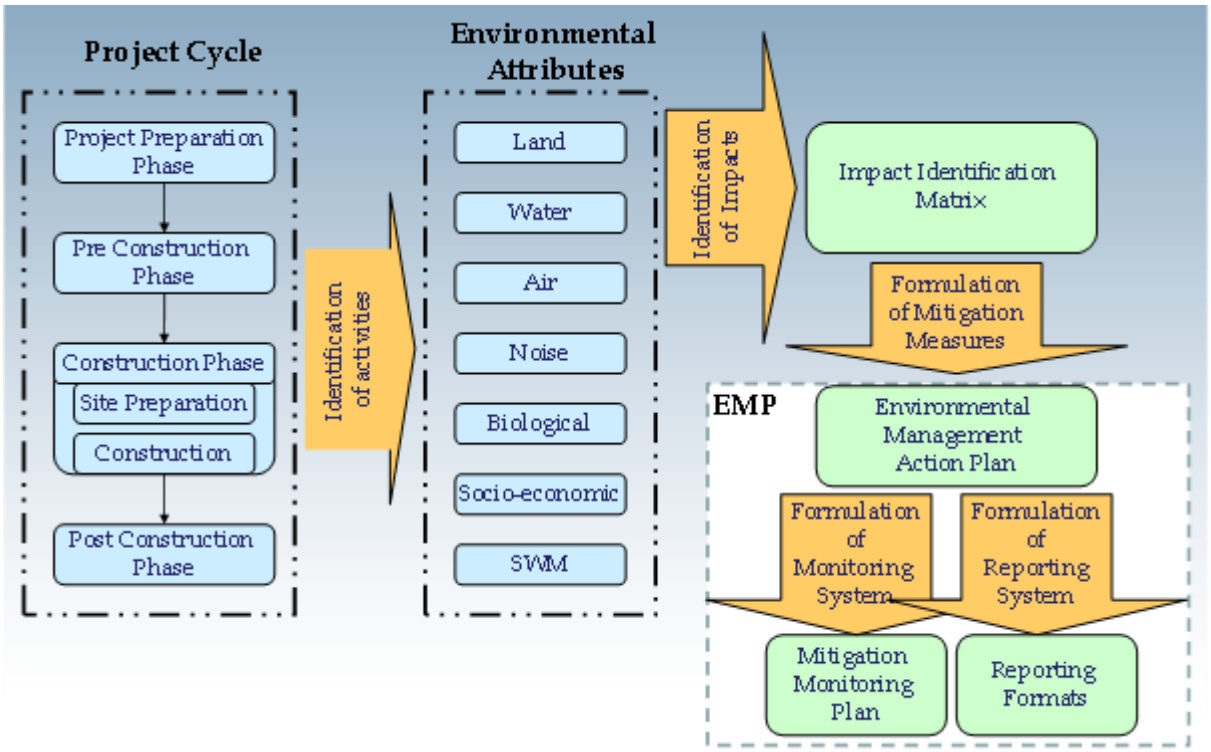
Table 1.2. Guidelines in Generic EMAP

Sl. No.	Title
A	**Guidelines for entire project stretch**
1.	Guidelines for preparing comprehensive waste management plan
2.	Guidelines for top soil conservation and reuse
3.	Guidelines for Provision of Noise Barriers
4.	Guidelines to Ensure Worker's Safety during Construction
5.	Guidelines for Preparation of Traffic Management Plan
6.	Guidelines for Storage, Handling, Use and Emergency Response For Hazardous Substances
7.	Environmental monitoring plan
B	**Guidelines for project facilities**
1.	Guidelines for siting, management and redevelopment of construction camps
2.	Guidelines for siting, management and redevelopment of labour camps
3.	Guidelines for siting, management and redevelopment of quarrying and stone crushing operations
4.	Guidelines for siting, management and redevelopment of borrow areas
5.	Guidelines for siting and management of debris disposal site

The guidelines for project facilities have been structured with following objectives:

(i) It facilitates the selection of a site with least environmental impact,
(ii) It looks into the satisfaction of the land owner in case of leased out / rental out lands,
(iii) It guides the Contractor with step by step measures in setting up of an efficient and environment friendly camp / site,
(iv) It ensure smooth, safe and efficient functioning of these camps and sites
(v) It guides the Contractor in preparing a camp / site management and restoration plan to be submitted to CSC (prior to setting up of the camp/site)
(vi) It facilitates restoration of the site at the closure stage in a very environment friendly manner.

EMP assigns the responsibilities for various actions identified to limit the adverse impacts of the project. An environmental monitoring plan and an institutional framework have been proposed as part of the EMP for proper implementation and monitoring of mitigation measures. The cost for implementing the proposed environmental mitigation measures and carrying out the environmental monitoring has been worked out and is presented as part of the EMP for necessary budgetary allocations as part of the project cost. In order to implement various environmental requirements during pre construction, construction and operational phases, all mitigation and enhancement measures have been clearly built in to the Environmental Management Plan. All necessary mitigation and enhancement costs have been part of the BOQ.



1.5.1. Lessons from Review of EMP Implementation, KSTP-I

The major findings from the review of implementation of EMP for KSTP–I, conducted by Wilbur Smith Associates in 2010 are given below:

Sl. No.	Issues in implementation of EMP	Measures incorporated in EMP for KSTP-II
1.	Lack of commitment by Contractors CSC is helpless to take action against Contractor	Penalty clause is included in the contract document
2.	Lack of awareness	Training by CSC and KSTP
3.	Too many reporting formats	A simplified reporting and monitoring system has been evolved with fewer reporting frequency shared responsibility between Contractor and CSC
4.	Impractical instructions in EMP	Unfeasible measures have been simplified – for eg,. Criteria of siting project facilities has been relaxed considering the topographic features of Kerala. Specific guidelines are added to enable the Contractor implement the EMP very effectively.

1.6. Definition of Terms Used in the Project

Nodes: Nodes are numbered locations representing urban centres or important road junctions usually used for start or termination points for project roads. In the case of Link 84 project road node number of Punalur is 12 and nod number of Thodupuzha is 40.

Links and Sub links: All project roads were identified by link numbers in the Project feasibility report of April 2000. According to this the 67 Links represented 2810 km of roads most of which were identified earlier by the Strategic Option Study (SOS) for detailed feasibility studies.

Package: Packages are identified for the purpose of creating attractive construction contracts to National and International Contractors. A package average of 100 km of roads is made up of two or more Links. Contractors may not take interest in a contract if it is not of sufficient size and profitability to merit attention. A Contractor may bid for more than one contract package. There are five highway contract packages to be implemented in two phases, identified in the Kerala State Transport Project in addition to the KSTP-I Inland Water Transport (IWT) Pilot Project.

ROW: The Right Of Way (ROW) is the land width legally available to the State PWD. The actual Right Of Way can only be established after the legal verification of all adjoining properties.

The ROW is often encroached upon on one or both sides. ROW details were not made available to the consultants and were defined by the Client as that area determined by the physical appearance of the existing limits of the Highway, which has been open to the public for unrestricted access over many years. This aspect has been covered in detail in the RAP.

Available Corridor: Since the legal ROW details are not available from the PWD, the consultants considered the existing corridor width that is physically available as defined above and referred to it as available corridor for the purpose of project preparation.

Realignment: Realignment usually refers to an increase in the horizontal curve radius but may be generally applied to any change in the vertical or horizontal alignment of a road.

Bypass: A bypass is the term usually applied to a road, which provides an alternative route around a congested urban area. This usually helps to divert through traffic away from the urban centre. No bypasses have been considered in this project.

Private trees: These are trees situated in private properties within the required corridor and which will need to be compensated in monitory terms according to the Resettlement Action Plan.

Public trees: Public trees are those trees that are located within the available corridor of the PWD or on a Puramboke Land (no registered ownership but accounted as land of the Revenue Department).

'OXBOW LAND': This is the ROW that will be superseded during any realignment. This is a common occurrence on many roads in Kerala especially in the midlands and their creation is compared to the 'Oxbow lake formation' during the evolution of rivers. It is referred to as 'Oxbow Land' for easy identification of such areas for Environmental Management. There are numerous such existing oxbow lands remaining unutilized in the State.

Chapter 2. Project Description

2.1. Regional Setting of the Project Road

The State of Kerala is located in the South-West of the Union of India. Presently there are 14 districts and 63 taluks in the State. The population density of the State is very high, 749 per sq.km. The State is bordered by the Arabian Sea on the West and South, the State of Tamil Nadu on East and Karnataka State to the North.

The project road under consideration is located in the Kottayam, Idukki districts. The regional setting of the project road is shown in **Figure 2.1**.

2.2. Link Description

The project road designated as Link-84, starts at NH-220 at chainage km 81.00 at Ponkunnam and ends at chainage km 134.000 at Thodupuzha. The road is situated in the mid land and high land region and road passes through rolling and hilly terrain, the location details are given in **Figure 2.2** below.

Environmental Data Sheet

Environmental data sheet comprises of chainage wise existing details of environmental and social features, road furniture details, location of cross drainage structures and water body and sensitive receptors details of the corridor (Link 84). **Table 2.1** presents the Environmental Data Sheet for Link 84.

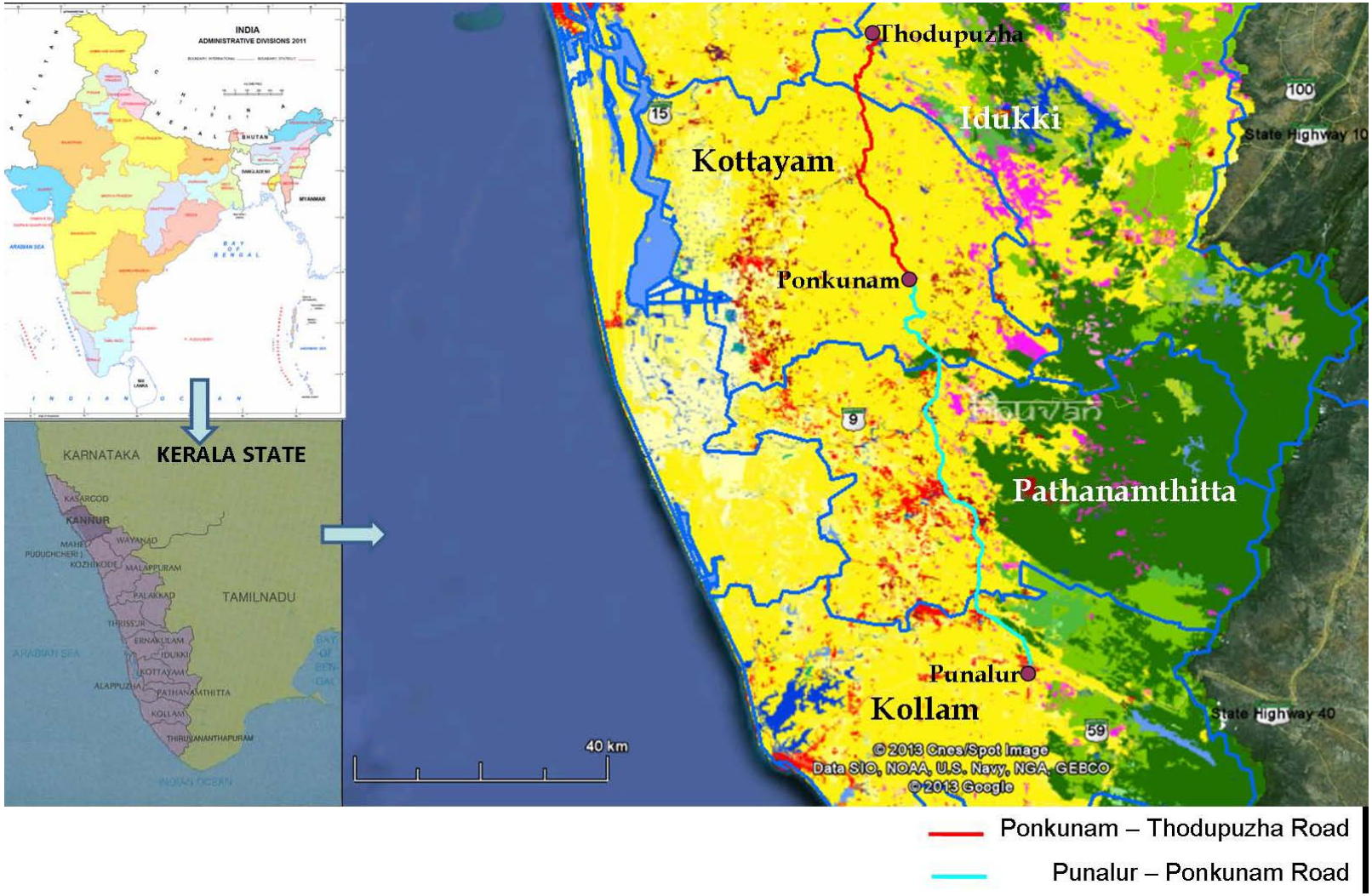


Figure 2.1. Regional Setting of the Project Area

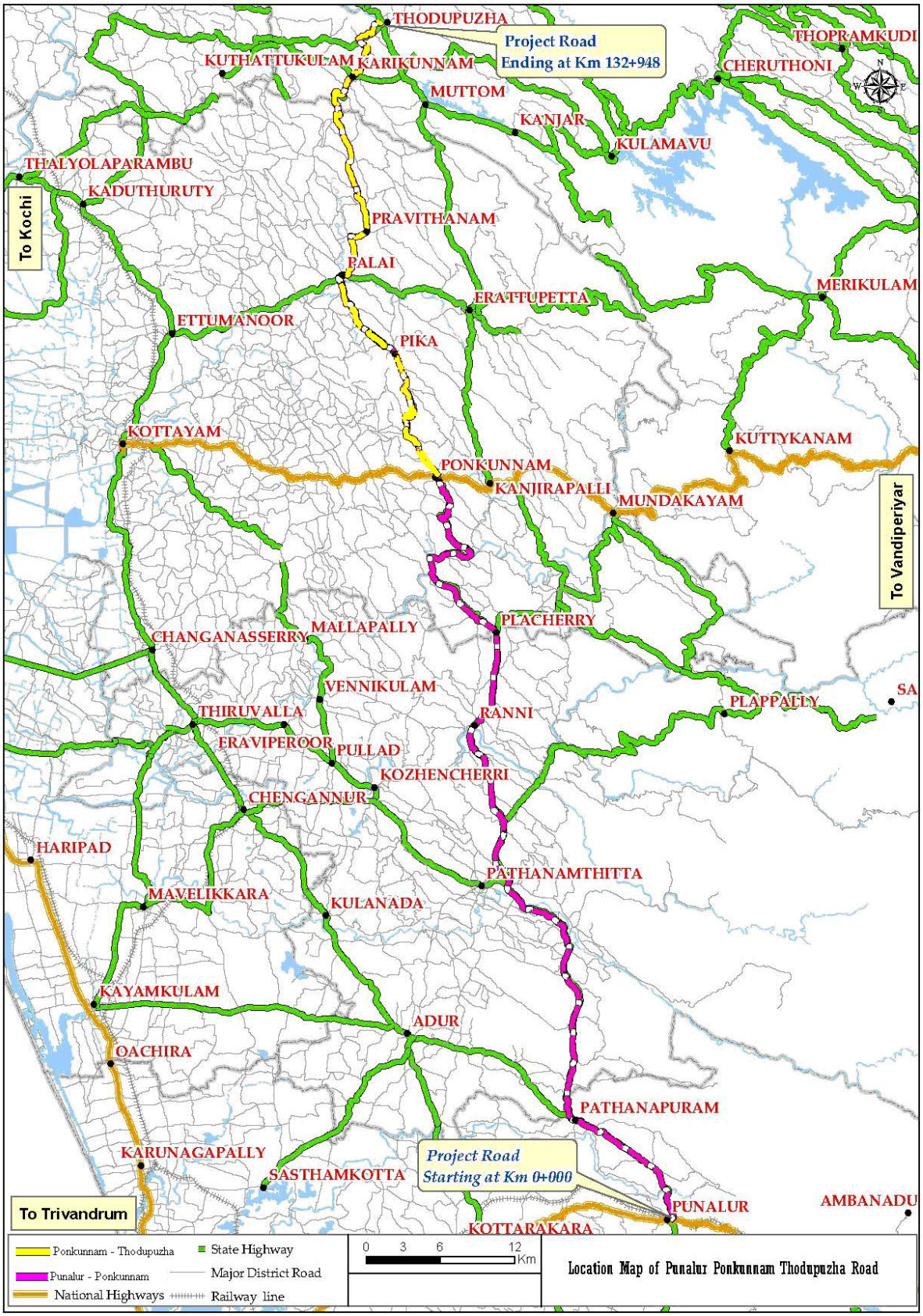


Figure 2.2. Location Map of Ponkunnam – Thodupuzha Road

Table 2.1 Environmental Data Sheet

Chainage in km		Environmental and Social Features		Bus Stops / Service Roads / Market Areas / Accident 'Black Spots'	Paddy Fields / Cross Drainage (CD) Structures / Water body	Hospitals / Schools / Shrine / Auto / Taxi / Bus Stands	Remarks
From	To	Left Side (West side) of the Road	Right Side (East side) of the Road				
80	81	Houses, rubber plantation, bus stop	Houses, rubber plantation, bus stop, auto rickshaw stand, bore well, temple, public water tap	Bus stop on left		Auto rickshaw stand, bore well, temple, public water tap on right	
81	82	Houses, rubber plantation, trees, coconut, hospital, public water tap	Houses, trees, areca nut, rubber plantation, library, 2 public water taps			Hospital, public water tap on left; library, 2 public water taps on right	
82	83	Houses, rubber plantation, valley, mosque, 3 public water taps	Houses, rubber plantation, church			Mosque, 3 public water taps on left; church on right	
83	84	Shops	Shops				
84	85	Built up area, shops, bus stand, taxi stand, 2 churches, school, public water tap, bus stop, side drain	Built up area, shops, public water tap, shrine, public open well, bus stop, rubber plantation, side drain	Bus stops on both sides; bus depot on left		Taxi stand, bus stand, school, 2 churches, public water tap on left; Public water tap, shrine, open well on right	
85	86	Houses, rubber plantation, trees, bus stop	Houses, rubber plantation, trees, 2 bus stops, 2 public water taps	One bus stop on left; 2 bus stops on right		2 Public water taps on right	
86	87	Houses, trees, rubber plantation, bus stop	Houses, trees, rubber plantation, bus stop, public water tap, hospital	Bus stops on both sides		Public water tap, hospital on right	
87	88	Houses, trees, rubber plantation, coconut plantation, bus stop	Houses, trees, rubber plantation, bus stop, shrine	Bus stops on both sides		Shrine on right	

Chainage in km		Environmental and Social Features		Bus Stops / Service Roads / Market Areas / Accident 'Black Spots'	Paddy Fields / Cross Drainage (CD) Structures / Water body	Hospitals / Schools / Shrine / Auto / Taxi / Bus Stands	Remarks
From	To	Left Side (West side) of the Road	Right Side (East side) of the Road				
88	89	Houses, shops, trees, rubber plantation, 2 bus stops, temple, 2 shrines, 2 schools, library, taxi stand	Shops, trees, 3 bus stops, temple, shrine, rubber plantation	2 Bus stops on left; 3 bus stops on right		2 Schools, library, temple, 2 shrines, taxi stand on left; temple, shrine on right	
89	90	Rubber plantation, open well, public water tap, school, church	Houses, rubber plantation, school, bus stop, shrine, coconut plantation, teak plantation	Bus stop on right		Open well, public water tap, school, church on left; school, shrine on right	
90	91	Houses, trees, rubber plantation, bus stop	Houses, rubber plantations, teak plantation, bus stop, stream parallel to road	Bus stops on both sides	Stream parallel to the road on right		
91	92	Shops, rubber plantation, trees	Rubber plantation, trees, stream		Stream parallel to the road on right for the entire length		
92	93	Rubber, areca nut, teak plantations, bus stop	Houses, rubber plantation, stream	Bus stop on left	Stream on right		
93	94	Houses, rubber, teak plantations, bus stop, church, shrine, school	Houses, trees, rubber plantation, 2 bus stops, stream	One bus stop on left; 2 bus stops on right	Stream on right Bridge 94/1	Church, shrine, school on left	
94	95	Houses, rubber plantation, temple, shrine, bus stop, school	Houses, rubber plantation, bus stop	Bus stops on both sides		Temple, shrine, school on left	Realignment on left
95	96	Buildings, trees, rubber plantation	Houses and shops				

Chainage in km		Environmental and Social Features		Bus Stops / Service Roads / Market Areas / Accident 'Black Spots'	Paddy Fields / Cross Drainage (CD) Structures / Water body	Hospitals / Schools / Shrine / Auto / Taxi / Bus Stands	Remarks
From	To	Left Side (West side) of the Road	Right Side (East side) of the Road				
96	97	Houses, rubber plantation, shops, pepper, teak, hospital, jeep stand, auto rickshaw stand, bus stop, church	Shops, auto rickshaw stand, school, 2 public water tap, shrine, bus stop	Bus stops on both sides		Hospital, church, jeep, auto stands on left; auto stand, school, public watertap, shrine on right	
97	98	Houses, rubber plantation, 2 bus stops, saw mill, trees, coconut plantation, banana, cocoa, teak, tapioca	Houses, trees, rubber plantation, 2 bus stops, cocoa, tapioca, teak	2 Bus stops on left; 2 bus stops on right			
98	99	Houses, trees, rubber plantation, school, shrine, bus stop, hospital, banana, tapioca, pepper cultivation	Houses, rubber plantation, church	Bus stop on left		School, shrine, hospital on left; church on right	Realignment on right
99	100	Houses, trees, shops, paddy field, bus stop, bore well	Houses, trees, rubber plantation, hospital, shrine, bus stop, school, areca nut, tapioca, coconut	Bus stop on both sides	Paddy field on left	Bore well on left; hospital, shrine, school on right	
100	101	Houses, trees, paddy field, areca nut, coconut, shops, auto rickshaw stand, shrine, bus stop, stream, rubber plantation	Houses, rubber plantation, trees, pineapple cultivation, public open well, bus stop	Bus stop on both sides	Stream very close and parallel to the road on left	Auto rickshaw stand, shrine on left; open well on right	
101	102	Houses, trees, rubber plantation, auto rickshaw stand, 2 bus stops, stream	Houses, trees, rubber plantation, banana, teak, cocoa, areca nut, 2 shrines, bus stop, school	2 bus stops on left; one bus stop on right	Stream very close and parallel to the road on left	Auto rickshaw stand on left; 2 shrines, school on right	Realignment on right

Chainage in km		Environmental and Social Features		Bus Stops / Service Roads / Market Areas / Accident 'Black Spots'	Paddy Fields / Cross Drainage (CD) Structures / Water body	Hospitals / Schools / Shrine / Auto / Taxi / Bus Stands	Remarks
From	To	Left Side (West side) of the Road	Right Side (East side) of the Road				
102	103	Houses, trees, shops, rubber plantation, 2 bus stops, stream	Houses, shops, rubber plantation, 2 bus stops, school	2 Bus stops on left; 2 bus stops on right	Stream very close and parallel to the road on left	School on right	
103	104	Houses, shops, rubber plantation, Trees, bus stop, church, banana cultivation	Houses, shops, rubber plantation, 2 churches, bus stop, public water tap	Bus stops on both sides		Church on left; 2 churches on right	
104	105	Houses, shops, bus stop, hospital, auto rickshaw stand	Houses, shops, trees, teak, coconut, rubber, bus stop, public water tap	Bus stops on both sides	River across the road Bridge 105/1	Hospital, auto rickshaw stand on left; public water tap on right	
105	106	Shops, church, 2 auto rickshaw stands, KSRTC bus stand, bus stop, mini lorry stand	Shops, auto rickshaw stand, jeep stand, 2 bus stops, municipal bus stand	One bus stop on left; 2 bus stops on right	Stream across the road Bridge 106/1	Church, 2 auto rickshaw stands, mini lorry stands on left; auto rickshaw, jeep stands on right	
106	107	Houses, shops, trees, bus stop, paddy field	Houses, shops, trees, cocoa, rubber, coconut, hospital	Bus stop on left	Paddy field on left	Hospital on right	
107	108	Houses, teak, areca nut, coconut, banana, tapioca, 3 bus stops, church, public water tap	Houses, rubber plantation, teak, 3 bus stops, vacant land	3 Bus stops on left; 3 bus stops on right		Church, public water tap on left	
108	109	Houses, trees, rubber plantation, 2 bus stops, school	Houses, rubber plantation, banana, teak, coconut, bus stop, church, school	2 Bus stops on left; 1 bus stop on right		School on left; church, school on right	
109	110	Houses, trees, teak, tapioca, coconut, rubber plantation, shops, bus stop, side drain	Houses, shops, rubber plantation, bus stop	Bus stops on both sides			

Chainage in km		Environmental and Social Features		Bus Stops / Service Roads / Market Areas / Accident 'Black Spots'	Paddy Fields / Cross Drainage (CD) Structures / Water body	Hospitals / Schools / Shrine / Auto / Taxi / Bus Stands	Remarks
From	To	Left Side (West side) of the Road	Right Side (East side) of the Road				
97	98	Houses, rubber plantation, 2 bus stops, saw mill, trees, coconut plantation, banana, cocoa, teak, tapioca	Houses, trees, rubber plantation, 2 bus stops, cocoa, tapioca, teak	2 Bus stops on left; 2 bus stops on right			
98	99	Houses, trees, rubber plantation, school, shrine, bus stop, hospital, banana, tapioca, pepper cultivation	Houses, rubber plantation, church	Bus stop on left		School, shrine, hospital on left; church on right	Realignment on right
112	113	Shops, trees, banana, rubber, areca nut, borewell, water tap, shrine, bus stop	Trees, rubber plantation, school, bus stop, hospital, vacant land	Bus stops on both sides	Bridge 113/1	Bore well, water tap, shrine on left; school, hospital on right	
113	114	Houses, shops, trees, rubber, banana, coconut, teak, auto rickshaw stand, bus stop	Houses, shops, rubber, teak, banana, shrine, bore well, bus stop	Bus stops on both sides	Stream across the road Bridge 114/1	Auto rickshaw stand on left; shrine, bore well on right	
114	115	Buildings, trees, rubber plantation, coconut, shrine, bus stop, church	Buildings, trees, rubber plantation, school, bore well, bus stop	Bus stop on both sides		Shrine, church on left; school, bore well on right	
115	116	Buildings, trees, coconut, side drain, canal, paddy field	Buildings, trees, rubber plantation, banana cultivation		Canal on left		
116	117	Shops, trees, paddy field, pond, canal, shrine, bus stop, post office	Shops, trees, rubber plantation, 2 bus stops	One bus stop on left; 2 bus stops on right	Pond, canal on left	Shrine on left	

Chainage in km		Environmental and Social Features		Bus Stops / Service Roads / Market Areas / Accident 'Black Spots'	Paddy Fields / Cross Drainage (CD) Structures / Water body	Hospitals / Schools / Shrine / Auto / Taxi / Bus Stands	Remarks
From	To	Left Side (West side) of the Road	Right Side (East side) of the Road				
117	118	Buildings, rubber plantation, bus stop	Buildings, rubber, school, bus stop, side drain, bore well	Bus stops on both sides	Bridge 118/1	School, bore well on right	Bridge
118	119	Buildings, trees, rubber, 2 bus stops, school	Buildings, shops, shrine, church, 2 bus stops	2 Bus stops on left; 2 bus stops on right		School on left; shrine, church on right	
119	120	Buildings, rubber plantation, bus stop	Trees, rubber plantation, areca nut, bus stop	Bus stops on both sides			
120	121	Buildings, trees, rubber plantation, bus stop, library, post office	Shops, paddy field, side drain, bus stop, rubber plantation	Bus stops on both sides		Library, post office on left	
121	122	Valley, trees, rubber plantation, bus stop,	Hills, trees, rubber plantation, bus stop	Bus stop on both sides			
122	123	Valley, trees, rubber plantation, public water tap	Hills, rubber plantation, bus stop, valley	Bus stop on right			
123	124	Buildings, rubber plantation, bus stop, 2 public water taps	Valley, buildings, rubber plantation, trees	Bus stop on left			
124	125	Houses, trees, bus stop, 3 public water taps, stream	Houses, rubber plantation	Bus stop on left	Stream on left		
125	126	Houses, shops, valley, bore well, bus stop, school, shrine, taxi stand, tapioca, pineapple	Houses, rubber plantation, rock, bus stop, 2 public water taps	Bus stops on both sides		Bore well, school, taxi stand, shrine on left; 2 public water taps on right	

Chainage in km		Environmental and Social Features		Bus Stops / Service Roads / Market Areas / Accident 'Black Spots'	Paddy Fields / Cross Drainage (CD) Structures / Water body	Hospitals / Schools / Shrine / Auto / Taxi / Bus Stands	Remarks
From	To	Left Side (West side) of the Road	Right Side (East side) of the Road				
126	127	Shops, houses, rubber plantation, auto rickshaw stand, school, 2 bus stops, public water tap, police station	Houses, shops, trees, 3 public water taps, paddy field, auto rickshaw stand, bus stop, church, shrine	2 Bus stops on left; one bus stop on right		Auto rickshaw stand, school, public water tap, police station n on left; auto rickshaw stand, church, shrine, 3 public water taps on right	
127	128	Houses, rubber plantation, public water tap, coconut trees	Houses, trees, rubber plantation, stream		Stream on right	Public water tap on left	
128	129	Houses, rubber plantation, bus stop, public water tap, coconut trees	Houses, trees, rubber plantation, public water tap, 2 bus stops, shrine	One bus stop on left; 2 bus stops on right		Shrine on right	
129	130	Houses, rubber plantation, areca nut, 3 public water taps	Houses, trees, rubber plantation, stream		Stream on right	3 Public water taps	
130	131	Houses, rubber plantation, hill, 2 public water taps	Houses, rubber plantation, library		Canal across road	Library on right	
131	132	Houses, trees, shops, valley, rubber plantation, bus stop, 2 public water taps	Houses, shops, school, rubber plantation, public water tap	Bus stop on left	Bridge 132/1	2 Public water taps on left; school, one public water tap on right	
132	133	Houses, shops, 3 bus stops, shrine, school, petrol pump	Houses, shops, 3 bus stops, public water tap	3 Bus stops on left; 3 bus stops on right		School, shrine on left; public water tap on right	
133	134	Shops, 2 bus stops, auto rickshaw, taxi, jeep stands	Shops, auto rickshaw stand, school, shrine, church	2 Bus stops on left	Thodupuzha river across road Bridge 134/1	Auto rickshaw, taxi, jeep stands on left; auto rickshaw stand, school, shrine, church on right	

2.3. Proposed Project Improvements

Study mandates the improvement of the project road to two lane with paved shoulder standards with other improvements to make the road a standard facility. Improvement proposals formulated are based on the IRC guidelines and site specific requirements. The proposed improvements are aimed at easing traffic congestion, reducing the road accidents by improving physical characteristics of the road, which includes geometry, pavement strength, drainage, and enhancing the aesthetics. General philosophy followed in formulating the improvement proposals are:

- Limit the improvements within the land identified for the project.
- Introduce transition to all the curves along the alignment
- Utilize the available Right of Way to the maximum extent possible so as to avoid additional land acquisitions
- Retain the geometric properties of finalized alignment during the study carried out in 2002
- Improve and introduce the project facilities
- Improvement of road safety features

Accordingly, the following optimum level of improvements is proposed:

- Widening of the project road as the traffic warrants;
- Strengthening/reconstruction of the existing pavement for the entire length;
- Provision of footpath cum built-up drain at built up and industrial locations;
- Improving / redesigning sharp curves;
- Widening/ reconstruction of existing culverts and provision of additional culverts depending on the cross drainage requirements;
- Bridge and cross drainage rehabilitation, widening and reconstruction.
- Junction improvements;
- Provision for pedestrian crossing facilities;
- Provision of traffic signs and road furniture;
- Provision of bus shelters

Based on the above improvements, realignments are proposed at eighteen locations. The details of corresponding realignments/ oxbow lands are given in the **Table 5.0** in **Annexure 3.50.**

The suitability of the Puramboke land/oxbow land for various purposes depends upon the location, namely whether it is located in rural, semi urban, or urban areas. Hence, it has been decided by KSTP, to develop these lands in consultation with other state government departments, so that the proposed activity will be socially and economically feasible and sustainable in the long run. Accordingly, only type C enhancement measure (where space is limited and buildings are not proposed) will be undertaken at present, as it involves only tree planting, seating parking and solid waste collection facilities. Other enhancement types – A and B – will be taken up at a later stage by KSTP as a separate activity.

2.4. Environmental Enhancement Measures Adopted in the Project

General environmental enhancement measures proposed for the project are construction of sound insulating stone wall to abate sound at silent zone, providing hand pump facility, reconstruction of affected open well, planting trees on the inner side of the sound insulating wall as noise barrier at sensitive locations, planting trees on both sides of the road at places where land is available, landscaping of junctions etc. Apart from this, public utilities such as construction of bus shelters at bus bay locations, providing parking facilities for autorickshaws, taxis, jeeps and tempos, signboards indicating prominent locations along project road, improvement of parks and gardens will be undertaken along the project corridor.

The environmental impact mitigation measures and enhancement measures proposed are covered under Link Specific EMAP and the typical design drawings are provided as **Annexure 3.53**. The landscaping, tree planting, shrub planting etc. are provided as an environmental enhancement measure in type C oxbow land as shown in **Annexure 3.50** and **3.53**.

The specification for oxbow land development will be provided to the Contractor as and when required. The value of such areas will be further increased if located close to any tourist attractions, or Pilgrim/religious centres. The envisaged improvements are of three types as provided in **Annexure 3.50** *Landscaping, Tree planting and Environmental Enhancement Plan*.

Chapter 3. Environmental Management Action Plan

Environmental mitigation measures have been incorporated within the design process, including the avoidance of potential impacts through changes in the alignment and other means. Appropriate measures have also been identified for action in the construction and operational phases. **Table 3.1** and **Table 3.3** tabulates the measures identified for all phases i.e., the design, pre-construction, construction and operational phases, identifies the nature of the potential environmental impact, the measures, which have, or will be taken, the implementing agency and responsible organisation, and, where appropriate, the contractual clause or drawing no. referring to the measure.

The **Table 3.1** and **Table 3.2** called 'Generic EMAP' lists those measures, which are common to all roads, while **Table 3.3** and **Table 3.4** called 'Link Specific EMAP' lists those measures which are specific to this link.

The EMAP can also classified based on responsibility of implementation of mitigation measures such as EMAP for PMT, CSC and others i,e., **Table 3.1** and **Table 3.3** and EMAP for Contractor i,e., **Table 3.2** and **Table 3.4**. EMAP for PMT, CSC and others includes stake holders comprises of planning department, local police & fire station, state motor vehicle department and other organisations which are directly or indirectly associated with the project. EMAP for Contractor will be monitored by CSC/PMT.

The role and responsibility of the responsible organisations mentioned in the table are mentioned below.

Kerala State Pollution Control Board (KSPCB)- The State Pollution Control Board will be responsible for any matters related to air, water and noise pollution during construction and operational stages. Any matters related to this may be brought under their notice for solution.

Forest Department- Any matters related to social forestry, forests, wildlife and trees etc should be consulted with the local DFO or Forest Range Officer, Forest Department depending upon the advice required.

PMT and PWD- PMT will be available only in the State head quarters at Thiruvananthapuram. Most of the work in the local level will be taken care of at the local PWD/PMT level through out Kerala.

Final Design Consultant- Preparation of final road designs and contract documentation based on the preliminary road designs and the formulation of the Environmental Management Plan and Environmental Management Action Plan recommendations.

Environmental Engineer of PMT- EE will be responsible for all matters of environmental monitoring and inter Governmental coordination.

Traffic Police and State Police- any matters related to traffic and violation of traffic and other law and order issues may be taken up with the traffic police and State Police.

Kerala Water Authority- The Kerala Water Authority (KWA) will be responsible for any matters relating to water supply, water taps, bore wells and tube wells along the sides of the roads.

Water Resources * Department- The water resources department will be responsible for all matters relating to rivers, canals, waterways and irrigation canals.

Local bodies (Panchayat and Municipal Authorities)- Panchayat and Municipal authorities will be responsible for local bus waiting sheds, Panchayat and municipal public wells etc.

Motor Vehicle Department- The motor vehicle department will be responsible for the issue and matters relating to Pollution Under Control Certificates, driving licences etc.

Fire Force and Fire Station- the matters relating to safety especially relating to fire safety may be taken up with the Fire force.

Archaeological Department- All matters relating to ancient archaeological structures and historical monuments that may encounter during construction works or identified during pre-construction stage.

Mining and Geology Department- All matters relating to quarry and sand materials may be referred to State Mining and Geology Department.

Penalty Clause for Nonconformity to EMP

Clause No.	Description
Sub-Clause 14.6: Protection of the Environment	The Contractor shall implement all mitigation measures for which responsibility is assigned to him as stipulated in the EMP Report. Any lapse in implementing the same will attract the penalty clause as detailed below: 1. All lapse in obtaining clearances / permissions under statutory regulations and violations of any regulations with regard to eco-sensitive areas shall be treated as a major lapse. 2. Any complaints of public, within the scope of the Contractor, formally registered with the CSC, or with the PWD complaint cell and communicated to the Contractor, which is not properly addressed within the time period intimated by the CSC / PMT shall be treated as a major lapse. 3. Non-conformity to any of the mitigation measures stipulated in the EMP Report (other than stated above) shall be considered as a minor lapse. 4. On observing any lapses, CSC shall issue a notice to the Contractor, to rectify the same. 5. Any minor lapse for which notice was issued and not rectified, first and second reminders shall be given after one month from the original notice date and first reminder date respectively. Any minor lapse, which is not rectified shall be treated as a major lapse from the date of issuing the second reminder. 6. If a major lapse is not rectified upon receiving the notice, CSC shall invoke the penalty clause, in the subsequent interim payment certificate. 7. Penalty for major lapses shall be with-holding of 10% of the interim payment certificate, subject to a maximum limit of Rs. 30 lakhs. 8. If the lapse is not rectified within three months after withholding the payment, the amount withheld shall be forfeited.

* Formerly Irrigation Department

Table 3.1. Part-I Generic Environmental Management Action Plan for PMT, CSC and Others

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	References
A. Project Preparation Phase					
A.1.	Preparation of Detailed Project Report	**Mitigation Measures for Impacts on Land and Water**			
		Proposed alignment is designed minimizing land requirement, RoW is kept to a minimum, avoiding religious buildings and other environmentally sensitive areas.	Design Consultant	PMT	EMAP
		Guidelines for sitting, management and redevelopment of project related facilities by the Contractor are presented in **Annexure 3.1** to **Annexure 3.5.**	Design Consultant	PMT	EMAP
		Erosion control measures like compaction of earth, pitching, turfing and landscaping with adequate drainage are included in engineering design**.**	Design Consultant	PMT	EMAP
		Slope stabilization and erosion control measures like compaction of earth, pitching, turfing, construction of retaining wall and landscaping with adequate drainage system such as slope drains and storm water drains are included in the engineering design.	Design Consultant	PMT	EMAP
		Concrete flooring, catch drain and oil interceptors are proposed for hot mix plant area, work shop, vehicle washing area and fuel handling area in construction camps as presented in drawing no. **PT - 1D 60-012**	Design Consultant	PMT	EMAP
		Sufficient number of drainage structures like culverts, storm water drains etc. are included in the engineering design to prevent flooding and water logging. Bridges have been designed for the 50-year flood frequency. All culverts have been designed for 25 years flood frequency. The fill height has been designed for 50-year flood.	Design Consultant	PMT	EMAP
		Mitigation Measures for Impacts on Water			
		Sedimentation trenches and storm water drain are proposed for surface runoff from construction camps as per the design presented in drawing no. **PT - 1D 60-013.**	Design Consultant	PMT	EMAP

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	References
		Toilets, sewage collection system and soak pits are proposed in construction camps, labour camps.	Design Consultant	PMT	EMAP
		Mitigation Measures for Impact on Air and Noise			
		Tree plantation along road and oxbow land is included in the design.	Design Consultant	PMT	
		Mitigation Measures for Impacts on Noise			
		Sensitive noise receptors along the project stretch are identified and noise barriers are proposed at these locations as per design given in **Annexure 3.44.**	Design Consultant	PMT	EMAP
		Mitigation Measures for Impacts on Flora and Fauna			
		Plantation of three trees for every tree to be cut has been proposed as per the guidelines of MoEF.	Design Consultant	PMT & PCC	EMAP
		Mitigation Measures for Socio-economic impacts			
		Proposed alignment is selected minimizing socio-economic impact. Information dissemination and community consultation has been undertaken. It is proposed to pay compensation to PAPs based on the RAP that includes the Entitlement Policy.	PMT NGOs recommended in RAP	PMT Environment Officer (EO)	EMAP
		Proposed alignment has been adjusted to minimize impact on religious and cultural properties.	Design Consultant	NA	EMAP
		Cultural properties along the alignment have been identified and proposed to relocate through prior consultation and approval of the local community.	Design Consultant	PMT	EMAP
		All community utilities such as stand posts, bore wells, wells, ponds, water supply lines, toilets, sewerage lines, drainage systems, optical fiber cables, electric power supply lines, transformers, irrigation pump houses, telephone and television cables have been identified for relocation. Cost of shifting the utilities are included in the project cost.	Design Consultant	PMT and PWD	EMAP

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	References
		It has been proposed to replace private dinking water source according to RAP and public water sources according to EMAP. It has also been proposed to make temporary arrangements if the existing water supply is disrupted.	Design Consultant	PMT and PWD	EMAP
		Road stretches which are accident prone and have adverse factors are identified and necessary design measures like improvement of horizontal and vertical road geometry, improvement of junctions, etc. are adopted for road safety. Refer **Annexure 3.33**. Sign boards, street lights and pedestrian facilities are proposed for the entire stretch.	Design Consultant	PMT and PWD	EMAP
		Existing bus stops have been suitably relocated or integrated to the design and bus lay bys, bus waiting shed and parking facilities for taxi, autorikshaw and tempo designs has been provided.	Design Consultant	PMT and PWD	EMAP
		Improved road surface with improved road geometry, pedestrian facilities bus bays and road furnitures have been planned. Signages have been given a high priority for all road junctions. Safety audits have been undertaken and corrective measures undertaken.	Design Consultant	PMT and PWD Traffic Police	EMAP
		Mitigation Measures for Impacts due to Solid Waste Generation			
		Demolition of sound highway structures has been avoided as far as possible by reinforcing them instead of replacing with new structures. Recycling / reuse of debris in highway construction has been considered wherever possible.	Design Consultant	PMT and PWD	EMAP
A.2.	Consent for Establishment	Application for Consent for Establishment has to be submitted to KSPCB.	PMT and PWD	PMT and PWD	Water (Prevention & Control of Pollution) Act, 1974 Air (Prevention & Control of

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	References
					Pollution) Act, 1981
A.3.	Training	Environmental Awareness Training. EMP Implementation Training. Environmental legislation training.	PMT and PWD	PMT and PWD	EMAP
		Training for Contractors.	CSC / PMT	PMT and PWD	EMAP
B Pre-construction Phase					
B.1.	Environmental Monitoring Facility and Equipment (Meters, Vehicles and Buildings)	This will include institutional requirements, training, environmental management and monitoring. Provision for purchasing required equipment.	EO of PMT, CSC	EO of PMT, SPCB	As a Project specific action this will have to be incorporated.
B.2.	Identification of sites for project facilities like construction camp, labour camp, quarry, crusher unit, borrow areas, debris and excess soil disposal	**Mitigation Monitoring during Siting of Project Facilities**			
		The suitability of identified site should be verified based on the reports submitted by the Contractor from time to time by the CSC through site visit and verification of records. This shall be a one time activity for each newly identified site, based on which the approval for the site shall be issued by CSC to Contractor.	CSC	PMT	
B.3.	Setting up of all project facilities like construction camp, labour camp, quarry, borrow area and debris disposal site	**Mitigation Monitoring during Setting up of Project Facilities**			
		CSC to monitor using checklists provided in **Annexures 3.20 to 3.24**, and through site inspection and records verification, whether the camps are being set up in line with the camp / site management plan submitted by the Contractor.	CSC	PMT	EMAP
B.4.	Clearing, grubbing and stripping, cutting of earth, filling, stripping, demolition	**Mitigation Monitoring During Site Preparation**			
		CSC to monitor through site visits, whether the mitigation measures outlined in EMAP are adhered to.	CSC	PMT	EMAP

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	References
C. Construction Activities					
C.1.	Operation of construction camp, quarry, stone crusher units, borrowing of earth and functioning of labour camps	**Mitigation Monitoring During Construction Stage**			
		CSC shall continue to monitor all the project facilities once in a quarter using checklists in **Annexures 3.20 to 3.24**. CSC shall continue to monitor all the construction activities using checklists given in **Annexures 3.25 to 3.29**. Reporting format for monthly report which has to be submitted to PMT by CSC is given in **Annexure 3.39**.	CSC	PMT	EMAP
		Noise level monitoring should be conducted as per Environmental Monitoring Plan.	CSC	PMT	EMAP
D. Post construction / Operational Phase					
D.1.	Redevelopment of construction and labour camp sites, quarry and crusher sites, borrow areas.	CSC to monitor using checklists provided in **Annexures 3.20** to **3.24**, and through site inspection and records verification, whether the camps / sites are redeveloped in line with the camp / site redevelopment plans submitted by the Contractor.	CSC	PMT	EMAP
		Proper implementation of traffic rules. Pollution Under Control (PUC) certificates should be undertaken.	PMT	Traffic police	EMAP
		Proper maintenance of traffic signs and implementation of accident care facilities along the road should be undertaken.	PMT	Traffic police	EMAP
		The cross drainage system and the flood water drains should be periodically cleared to avoid occurrence of floodings. Drainage systems should be maintained well to accommodate proper storm water flow.	PWD	PWD and ULBs	EMAP
		Contingency plans should be in place for clean up of spills of oil, fuel and toxic chemicals.	PWD, state police and fire station	PWD, state police	EMAP
		Public should be informed about the regulations on air pollution of vehicles.	State Motor Vehicles Department.	State Motor Vehicles Dept. and PMT	EMAP
		Noise monitoring to be undertaken along the project stretch at pre-identified locations using the noise metre of KSTP as specified in Environmental Monitoring Plan.	PMT	PMT	EMAP

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	References
		New buildings are prohibited within 50 mts of the carriageway.	Town & Country Planning Department, local governing body	PMT	EMAP
		Where ever required appropriate noise barrier should be constructed.	Town & Country Planning Department, local governing body	PMT	EMAP
		COMPLIANCE with "Rules" as defined in Environmental (Protection) Act, 1986, including: For delivery of hazardous substances, three certificates issued by transportation department are required - permit license, driving license, and guarding license. Vehicles delivering hazardous substances should be printed with standard signs. Public security, transportation and fire fighting departments should designate a special route for these vehicles. These vehicles should be parked only at designated parking lots. In case of spill of hazardous materials, relevant departments should be informed at once and deal with it in accordance with the spill contingency plan.	PWD	PMT, PWD Motor Vehicle Dept., State police and Fire Services	EMAP
		Safety Audits should be conducted.	PMT, PWD, Traffic police	PMT, PWD	NA

Table 3.2. Part-II Generic Environmental Management Action Plan for Contractor– Preconstruction Phase, Construction Phase and Operational Phase

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
A. Pre-construction phase					
A.1.	Identification of sites for project facilities like construction camp, labour camp, quarry, crusher unit, borrow areas, debris and excess soil disposal	**Mitigation Measures to be adopted at Siting Stage to Minimise all types of Impacts**			
		Locate the camp as per detailed site selection criteria given in **Annexure 3.1** to **Annexure 3.5.** The details of identified sites should be reported to the Construction Supervision Consultant (CSC) for approval in the format given in **Annexure 3.12** to **Annexure 3.19.**	Contractor	CSC	MoRTH Specification 111.1
		An agreement has to be signed with the land owner, if the land is taken on lease / rent. The agreement should specify the preferences of land owner about land re-development while handing over the site back to him.	Contractor	CSC	MoRTH Specification 111.1
		Camp / site[3] Management and Redevelopment Plan should be prepared as per guidelines given in **Annexure 3.1** to **Annexure 3.5** and submitted to CSC for approval. Activities in the site should be initiated only after getting written approval from CSC.	Contractor	CSC	MoRTH Specification 111.1
		Comprehensive Waste Management Plan, Occupational Health and Safety Management Plan and Hazardous Substances Management Plan should be prepared as per guidelines given in **Annexure 3.6, Annexure 3.9** and **Annexure 3.11.**	Contractor	CSC	MoRTH Specification 111.1
		Obtain required permissions before setting up the camp as per the details given in **Annexure 3.40**.	Contractor	CSC	MoRTH Specification 111.1

[3] Includes construction camp, labour camp, quarry and crusher unit, borrow area and debris disposal site.

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
		Site for overburden disposal should be planned within the quarry site or any other appropriate site. Quarry Management and Redevelopment Plan should address the disposal of overburden.	Contractor	CSC	MoRTH Specification 111.1
		Borrow Area Management and Redevelopment Plan should address the water logging issue.	Contractor	CSC	MoRTH Specification 111.1
		Record the number of trees to be cut in each site and make provision in the Management and Redevelopment Plans to plant three times the number of trees to be cut.	Contractor	CSC	MoRTH Specification 111.1
		Reporting format for monthly report which has to be submitted to CSC by Contractor is given in **Annexure 3.38**. Reporting format for work force management which has to be submitted to CSC by Contractor is given in **Annexure 3.30**.	Contractor	CSC	EMAP
A.2.	Identification of water sources	**Mitigation Measures for Impacts on Ground Water**			
		Only surface water should be used for construction and dust suppression. Possibility of using treated industrial water for dust suppression should be explored. Details of identified water sources should be submitted to CSC for approval in the format given in **Annexure 3.17.**	Contractor	CSC	MoRTH Specification 111.1
		Water for domestic use should be sourced from municipal water supply / approved water suppliers/ open well/ bore well. Clearance should be obtained from State Ground Water Board for construction of wells. Permission from relevant state authority (PWD / Irrigation dept.) should be obtained for surface water utilization.	Contractor	CSC	MoRTH Specification 111.1
		Mitigation Measures for Socio-Economic Impacts			

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
		Extraction of water from public water supply schemes, community spring water sources, community hand pumps, and community wells should be avoided. Local community should be consulted (with respect to the quantity of water, time and duration of withdrawal) before finalizing the surface water sources.	Contractor	CSC	MoRTH Specification 111.1
B.	**Construction Phase**				
B.1. Site Preparation Activities					
B.1.1.	Setting up of all project facilities like construction camp, labour camp, quarry, borrow area and debris disposal site	**Mitigation Measures for Impacts on Land and Water**			
		Topsoil conservation to be carried out as per guidelines given in **Annexure 3.7** before setting up of the project facilities.	Contractor	CSC	MoRTH Specification 111.4
		Once the project facility is setup, it should be entered in the register of sites given in **Annexure 3.19** in a chronological order.	Contractor	CSC	MoRTH Specification 111.1
		Concrete flooring with catch drain and oil interceptors should be constructed for hot mix plant area and work shop, vehicle washing and fuel handling area in construction camps and should be part of construction camp management plan as per the design presented in Drawing no. **PT- 1D 60-012**	Contractor	CSC	BOQ No. 11
		Sedimentation trenches should be constructed along the storm water drain in the construction camp as presented in Drawing no. **PT- 1D 60-013** to control soil erosion due to surface run off.	Contractor	CSC	MoRTH Specification 111.4
		Proper maintenance of vehicles and machineries should be carried out to minimize the spillage of oil. Provision should be made for storage of used oil. Authorization should be obtained from the SPCB under Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008 for collection, storage and disposal of hazardous wastes.	Contractor	CSC	Hazardous Wastes (Management and Handling) Rules, 2008 / PART II: MoRTH

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
					Specification 111.4
		Adequate no. of toilets with sewage collection system and septic tanks and soak pits should be provided separately for males and females in construction camps and labour camps.	Contractor	CSC	MoRTH Specification 111.1
	Setting up of all project facilities like construction camp, labour camp, quarry, borrow area and debris disposal site (Contd. from above)	Management Plans approved by the CSC should be strictly adhered to while setting up the sites and camps.	Contractor	CSC	MoRTH Specification 111.1
		Permissions Obtain required permissions before starting the operation of the camp as per the details given in **Annexure 3.40**.	Contractor	CSC	MoRTH Specification 111.1
		Contour trenches should be made around the quarry and crusher as presented in Drawing no. **PT-1D-60-014** to catch the sediments in surface run off and prevent surface water pollution.	Contractor	CSC	MoRTH Specification 111.3
		Minimum distance of any sewage or toilet facility from water sources should be 60 metres.	Contractor	CSC	MoRTH Specification 111.1
		Mitigation Measures for Impacts on Air and Noise			
		Arrangements should be made for regular sprinkling of water for dust suppression in construction camp, quarry areas, stone crushing units, access roads and borrow areas to control the air pollution due to dust.	Contractor	CSC	MoRTH Specification 111.1
		All dust producing units should be housed in a building with suitable wall, roofing and flooring. Dust extraction units with a collection system should be provided in the crusher unit and all transfer points.	Contractor	CSC	MoRTH Specification 111.8
		Roads inside the construction camp and stone crusher premises should be paved.	Contractor	CSC	MoRTH Specification 111.1
		All the vehicles should have Pollution Under Control certificate	Contractor	CSC	MoRTH Specification

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
					111.1
		Stack height and emission level of diesel generator in construction camp and crusher should meet the Kerala PCB guidelines to reduce air pollution.	Contractor	CSC	MoRTH Specification 111.1
	Setting up of all project facilities like construction camp, labour camp, quarry, borrow area and debris disposal site (Contd. from above)	Hot mix plants should have the latest, advanced pollution control measures available in the country.	Contractor	CSC	MoRTH Specification 111.5 and Section IX Particular Conditions (PC) Part B – Special Provisions, Sub clause 21.0
		Stack height and emission level of hot mix plants should meet the KSPCB guidelines. Diesel generator should have noise control measures to meet the noise standards set by Central Pollution Control Board (75 dB(A) at 1 m from the enclosure surface for generators with integral acoustic enclosure. Acoustic enclosure for generators without integral acoustic enclosure shall be designed for minimum 25 dB(A) insertion loss or for meeting the ambient noise standards, whichever is on the higher side at 0.5 m from the enclosure).	Contractor	CSC	MoRTH Specification 111.5 and System & procedures for compliance with noise limits for DG Sets upto 1000 KVA, CPCB, 2008.
		Noise level of vehicles used for construction activities should meet the noise standards set by Central Pollution Control Board (maximum 80 dB(A)).	Contractor	CSC	Environment Protection (Amendment) Rules, 2005

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
		Mitigation Measures for Impacts on Biological Environment			
		Green belt development along the camp boundary should be undertaken. No. of trees planted should not be less than three times the number of trees cut.	Contractor	CSC	MoRTH Specification 111.1
		LPG should be provided for cooking to avoid firewood collection from forest or nearby areas.	Contractor	CSC	MoRTH Specification 111.1
		Mitigation Measures for Socio - Economic Impacts			
		Safe drinking water and sanitation facilities comprising toilets, sewage collection system and septic tanks should be made available to the construction workers in all the camps and sites.	Contractor	CSC	MoRTH Specification 111.1
	Setting up of all project facilities like construction camp, labour camp, quarry, borrow area and debris disposal site (Contd. from above)	Personal protective equipments such as ear plugs, helmets, goggles, gloves etc. should be made available to the workers in construction camp, quarry areas, stone crusher unit and borrow areas.	Contractor	CSC	MoRTH Specification 111.1
		Labour camps should not be constructed with inflammable materials. Fire safety standards should be followed in both construction camp and labour camp construction.	Contractor	CSC	MoRTH Specification 111.6
		Fire fighting equipments like fire extinguishers shall be provided in the camp as per fire safety standards.	Contractor	CSC	MoRTH Specification 111.1
		Fencing should be provided for all the camps and sites to prevent trespassing of humans and animals into the camp.	Contractor	CSC	MoRTH Specification 111.1
		Operation manuals and training should be provided to machine operators. Warning signs should be placed at accident prone areas.	Contractor	CSC	MoRTH Specification 111.1
		Other provisions to ensure worker's safety shall be followed as per guidelines given in **Annexure 3.9**.	Contractor	CSC	MoRTH Specification 111.6
		Mitigation Measure for Impacts due to Solid Waste Generation			

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
		There should be provision of adequate space in all the camps and sites for segregated waste collection and waste handling.	Contractor	CSC	MoRTH Specification 111.1
		There should be provision of separate waste bins for bio-degradable, non-degradable and domestic and hazardous waste in the camps / sites.	Contractor	CSC	MoRTH Specification 111.1
		Comprehensive waste management plan to be prepared based on the guidelines given in **Annexure 3.6**. Debris / solid waste should be disposed in debris disposal site approved by CSC and based on the comprehensive waste management plan.	Contractor	CSC	MoRTH Specification 111.10
B.1.2.	Clearing, grubbing and stripping, cutting of earth, filling, demolition	**Mitigation Measures for Impacts on Land and Water**			
		Topsoil conservation should be undertaken as per guidelines given in **Annexure 3.7** to prevent its loss.	Contractor	CSC	MoRTH Specification 111.4
		Three times the no. of trees cut should be planted, wherever space is available along the road and in identified oxbow lands.	Contractor	CSC	BOQ No. 11
		The plants should be provided with adequate protection from animals and proper monitoring shall be carried out to ensure their survival and growth. Landscaping should be done with a lag of 3 to 4 months from the start of the work on any section. The section shall be deemed to be completed when the landscaping is over.	Contractor	CSC	MoRTH Specification 111.1
		Avoid dumping of earth into canals, drainage channels and water bodies. Earth, stone or any other construction material shall be properly disposed off safely so that the flow of water in cross drainage channels is not blocked.	Contractor	CSC	MoRTH Specification 111.1
		As far as possible avoid earthworks construction activity during monsoon.	Contractor	CSC	MoRTH Specification 111.4

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
		If any existing irrigation and drainage system ponds are damaged, they shall be suitably repaired.	Contractor	CSC	MoRTH Specification 111.4
		Mitigation Measures for Impacts on Air and Noise			
		Water should be sprinkled to suppress dust during any dust generating activity.	Contractor	CSC	BOQ No 11
		For cutting of rocks, instead of mechanical blasting, rock cutting process should be carried out to reduce the noise pollution.	Contractor	CSC	MoRTH Specification 111.1
		Machinery and vehicles should be well-maintained to keep their noise to a minimum.	Contractor	CSC	MoRTH Specification 111.1
		Mitigation Measures for Socio-Economic Impact			
		Provide adequate signages and cordon off the activity area so as to ensure the safety of the pedestrians and passers by. Temporary access should be maintained throughout the course of the work unless the Contractors make agreements with any affected frontages or legitimate road user.	Contractor	CSC	MoRTH Specification 111.1
		Mitigation Measures for Impacts due to Solid Waste Generation			
		Tree wastes should not be burned at site. They should be disposed off at debris disposal site or sold off as firewood. Over burden to be disposed off in the sites identified for the same as per the Comprehensive Waste Management Plan prepared based on guidelines given in **Annexure 3.6**.	Contractor	CSC	MoRTH Specification 111.1
B.1.3.	Demolition	Sprinkling of water should be carried out on site to suppress fugitive dust emissions.	Contractor	CSC	BOQ No. 11
		Debris to be disposed off in the sites identified for the same as per guidelines given in **Annexure 3.5.**	Contractor	CSC	MoRTH Specification 111.10

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
B.2. Construction Activities					
B.2.1	Operation of construction camp, quarry, stone crusher units, borrowing of earth and functioning of labour camps	**Mitigation Measures for Impact on Land and Water**			
		Proper maintenance of vehicles and machineries should be carried out to minimize the spillage of oil. Maintenance should be carried out on impervious platforms with spill collection provisions. Oil and grease waste generated from garages in construction camps should be drained out through catch drains and oil interceptors. Vehicle maintenance and refueling should be confined to areas in construction camps designed to contain spilled lubricants and fuels.	Contractor	CSC	MoRTH Specification 111.4
		Sanitation facilities, storm water drainage, catch drains and oil interceptors should be maintained properly.	Contractor	CSC	MoRTH Specification 111.1
		Management plans prepared for all project facilities and approved by the CSC should be strictly adhered to.	Contractor	CSC	MoRTH Specification 111.1
		Adequate care should be taken so that natural drainage patterns are not altered or blocked, while quarrying, borrowing, disposing off the over burden or any debris.	Contractor	CSC	MoRTH Specification 111.1
		Mitigation Measures for Impacts on Air			
		Emission levels of all vehicles, plants and machineries should be well within the prescribed limits. PUC certificates of all vehicles and machineries should be renewed at required intervals. Mixing equipment should be well sealed, and be equipped with a dust-removal device. Filtering mechanisms like air filter and water filter should be operational.	Contractor	CSC	MoRTH Specification 111.8
		Roads inside the construction camp and crusher premises should be tarred or concreted.	Contractor	CSC	MoRTH Specification

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
					111.1
		Water sprinkling should be undertaken for dust suppression. Provide sufficient water storage facility for 2 days use.	Contractor	CSC	BOQ No.11
		LPG should be provided for cooking and use of fire wood for cooking or any other purpose should be strictly banned.	Contractor	CSC	MoRTH Specification 111.1
		Air quality monitoring should be conducted at hot mix plant, quarry site and crusher location as per Environmental Monitoring Plan so that appropriate measures are taken up towards abatement of pollution.	Contractor	CSC	PART II: MoRTH Specification 111.1
		Mitigation Measures for Impacts on Noise			
		In construction camp: Vehicles used for construction activities should be maintained well, so as to ensure that the noise levels continues to be within the noise standards set by Central Pollution Control Board (maximum 80 dB(A)).	Contractor	CSC	Environment Protection (Amendment) Rues, 2005.
	Operation of construction camp, quarry, stone crusher units, borrowing of earth and functioning of labour camps (Contd. from above)	At construction camps within 150 m of human settlements, noisy construction should be stopped between 10:00 pm and 6:00 am.	Contractor	CSC	MoRTH Specification 111.1
		In quarry and crusher units: Controlled blasting techniques should be adopted in quarries. Conduct quarrying in a skillful, scientific and systematic manner. Follow a routine and preventive maintenance procedure for the DG set in consultation with the DG set manufacturer. The stack height of the DG set has to be adequate as per the guidelines of KPCB.	Contractor	CSC	MoRTH Specification 111.3
		Workers shall not be exposed to sound of more than 85 – 90 DB for more than eight hours a day and shall be provided with ear plugs.	Contractor	CSC	MoRTH Specification 111.1

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
		Mitigation Measures for Impacts on Biological Environment			
		Saplings planted for green belt development should be properly taken care of and protected to ensure their survival and growth.	Contractor	CSC	MoRTH Specification 111.1
		If the camp is located near the forest or private plantations, orient the labourers to refrain from any activities involving poaching, NTFP collection or spread of forest fire.	Contractor	CSC	MoRTH Specification 111.1
		Mitigation Measures for Socio-Economic Impacts			
		Provision of safe drinking water and access to sanitation services should be continued at satisfactory service levels.	Contractor	CSC	MoRTH Specification 111.1
		Construction workers should use the personal protective equipments provided to them and it shall be replaced if necessary. Fire fighting equipments like fire extinguishers provided in the camp should be maintained well.	Contractor	CSC	MoRTH Specification 111.1
		Fencing of the camp to prevent trespassing of humans and animals into the camp should be maintained properly.	Contractor	CSC	MoRTH Specification 111.1
		To the extent possible local people should be included in the labour force so that there are less incidence of crime. Information dissemination should be undertaken to generate awareness among migrant labourers about the sensitivities of the local region with respect to rules, laws, local customs and beliefs.	Contractor	CSC	MoRTH Specification 111.1
	Operation of construction camp, quarry, stone crusher units, borrowing of earth and functioning of labour camps	Other provisions to ensure worker's safety shall be followed as per guidelines given in **Annexure 3.9**. Follow guidelines in **Annexure 3.11** to ensure safety in storage and handling of hazardous substances.	Contractor	CSC	MoRTH Specification 111.6 and Section VII General Conditions of

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
	(Contd. from above)				Contract - Sub Clause 4.8 and 6.7
		On occurrence of any accident or injury, the safety officer should submit an accident report to the CSC in the format given in **Annexure 3.34.**	Contractor	CSC	MoRTH Specification 111.1
		Mitigation Measures for Impacts due to Solid Waste Generation			
		Waste petroleum and lubricants should be collected and sold out to approved oil recycling agencies. Other solid wastes should be collected and taken to approved disposal sites, according to GOI laws.	Contractor	CSC	MoRTH Specification 111.1
		Periodical maintenance of waste handling space should be undertaken in construction camp and labour camp. All types of solid waste should be collected and disposed of frequently as per Comprehensive Waste Management Plan. Debris / solid waste should be disposed in debris disposal site approved by CSC. Guidelines for management of debris disposal given in **Annexure 3.6** should be followed.	Contractor	CSC	MoRTH Specification 111.10
B.2.2.	Extraction of Surface water	Water should be drawn from only those sources that have got prior approval of CSC. Over extraction of surface water should be avoided.	Contractor	CSC	MoRTH Specification 111.1
B.2.3.	a) Transportation of materials b) Scarifying of existing bituminous layer	**Mitigation Measures for Impacts on Land and Water**			
		Vehicles and machinery should be maintained and refilled in such a fashion that fuel spillage does not contaminate the soil and their emission levels are as per norms of state PCB. Fuel storage and refilling sites should be kept away from cross drainage structures and important water bodies.	Contractor	CSC	MoRTH Specification 111.1

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
		Existing project road and haul roads maintenance should be undertaken regularly to reduce the damage due to over use and for easy plying of construction vehicles as well as regular local commuters.	Contractor	CSC	MoRTH Specification - 111.11
		Washing of vehicles, construction equipments and machineries near/inside the water bodies should be avoided to prevent water contamination.	Contractor	CSC	MoRTH Specification 111.4
		Mitigation Measures for Impacts on Air and Noise			
		All vehicles should have PUC certificates. Dust covers/ tarpaulins should be provided to cover construction material loaded on trucks.	Contractor	CSC	MoRTH Specification - 111.8
		Idling of delivery trucks or other equipment shall not be permitted during periods of unloading or when they are not active.	Contractor	CSC	MoRTH Specification 111.1
		Sprinkling of water should be carried out along the haul road at least twice a day on a regular basis during the entire construction period especially in the winter and summer seasons.	Contractor	CSC	BOQ No. 11
		Wherever the haul road is passing within 150 mts of human settlements, the transportation of material shall be stopped during night time (between 10:00 pm and 6:00 am.). At construction sites within 150 m of human settlements, noisy construction should be stopped between 10:00 pm and 6:00 am. Near sensitive receptors use temporary noise barriers and avoid work at night.	Contractor	CSC	MoRTH Specification 111.1
		Mitigation Measures for Socio-Economic Impacts			
		Workers should be provided with personal protective equipments such as ear plugs, helmets, goggles, gloves etc.	Contractor	CSC	MoRTH Specification

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
					111.1
		Other provisions to ensure worker's safety should be followed as per guidelines given in **Annexure 3.9.**	Contractor	CSC	MoRTH Specification - 111.6
		Traffic Management Plan shall be prepared based on guidelines presented in **Annexure 3.10** to reduce the disruption of traffic.	Contractor	CSC	MoRTH Specification 111.1
		Diversion roads should be paved, adequate traffic safety measures should be adopted**.**	Contractor	CSC	MoRTH Specification 111.1
		Mitigation Measures for Impacts due to Solid Waste Generation			
		Scarified material shall not be disposed off anywhere in an unscientific and unsafe manner. Scarified material should be reused for construction of internal roads within camps and sites.	Contractor	CSC	MoRTH Specification 111.1
B.2.4.	Compacting earth and laying of sub-base course, base course, construction of bridges, culverts, ROB, other structures etc.	**Mitigation Measures for Impacts on Land and Water**			
		Vehicles, machinery and equipments used in construction should be maintained and refilled in such a fashion that fuel spillage does not contaminate the soil or water. Construction vehicles should operate within the Corridor of Impact avoiding damage to soil and vegetation.	Contractor	CSC	MoRTH Specification 111.4
		Fuel storage and refilling sites should be kept away from cross drainage structures and important water bodies.	Contractor	CSC	MoRTH Specification 111.1
		All construction operators, drivers and workshop personal should be trained well so that they can take immediate measures for the spill of contaminate. All spills and construction debris should be disposed off in the sites	Contractor	CSC	MoRTH Specification 111.1

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
		identified for the same as per guidelines and the site should be fully cleaned before handing over.			
		Construction of foundation of bridges/ culverts during monsoon season should be avoided.	Contractor	CSC	MoRTH Specification 111.1
		Adopt necessary measures to prevent the wastewater produced during construction from entering directly into water bodies.	Contractor	CSC	MoRTH Specification 111.1
	Compacting earth and laying of sub-base course, base course, construction of bridges, culverts, ROB, other structures etc. (Contd.)	**Mitigation Measures for Impacts on Air**			
		Road surface should be cleaned with air compressor and vacuum cleaners prior to the construction works. Manual labour using brooms and blowing of air should be avoided.	Contractor	CSC	MoRTH Specification 111.1
		Sprinkling of water on site to aid compaction of the material and for dust suppression.	Contractor	CSC	BOQ No. 11
		The construction operations during nights, especially in the winter season shall be carried out under restricted conditions.	Contractor	CSC	MoRTH Specification 111.1
		Mitigation Measures for Impacts on noise			
		Construction contract shall clearly specify the use of equipment emitting noise of not greater than 90 dB (A) for the eight hour operation shift.	Contractor	CSC	MoRTH Specification 111.1
		For protection of construction workers, earplugs shall be provided to those working very close to the noise generating machinery.	Contractor	CSC	MoRTH Specification 111.1
		At construction sites within 150 m of human settlements, noisy construction shall be stopped between 10:00 pm and 6:00 am	Contractor	CSC	MoRTH Specification 111.1

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
		Near sensitive receptors use temporary noise barriers and avoid work at night. Public will be informed about the regulations on noise of vehicles. Proper signboards should be erected near sensitive receptors.	Contractor	CSC & PMT	MoRTH Specification 111.1
	Compacting earth and laying of sub-base course, base course, construction of bridges, culverts, ROB, other structures etc. (Contd.)	**Mitigation Measures for Impacts on flora and fauna**			
		Construction activity in and near water bodies should be restricted during breeding period of aquatic life.	Contractor	CSC & PMT	MoRTH Specification 111.1
		Mitigation Measures for Socio-Economic Impact			
		Traffic Management Plan should be prepared based on guidelines presented in **Annexure 3.10**.	Contractor	CSC & PMT	BOQ No. 11
		Diversion roads to be paved, adequate traffic safety measures to be adopted.	Contractor	CSC & PMT	MoRTH Specification 111.1
		All Contractors' staff should wear high visibility purpose made overalls or trousers/a waist coat at all times All operators working with any materials above head height (even in trenches) should wear hard hats all at times on the worksite.	Contractor	CSC & PMT	MoRTH Specification 111.1
		Other provisions to ensure worker's safety should be followed as per guidelines given in **Annexure 3.9**. On occurrence of any accident or injury, the safety officer should submit an accident report to the CSC in the format given in **Annexure 3.34**.	Contractor	CSC & PMT	MoRTH Specification 111.6
		Mitigation Measures for Impacts due to Solid Waste Generation			
		If the site is within 100 Km from thermal power plant permission under Fly Ash Notification, 2007, to be obtained from regional office of MoEF for using fly ash in the construction process.	Contractor	CSC & PMT	MoRTH Specification 111.1
		Debris shall be collected in a scientific manner and to be disposed off in the sites identified for the same as per guidelines given in **Annexure 3.5**.	Contractor	CSC & PMT	MoRTH Specification 111.10
B.2.5	Debris disposal	As far as possible, use the debris to interior unpaved road or the	Contractor	CSC & PMT	MoRTH

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
		approach roads / haul roads to strengthen it. It can also be used for filling of low lying play grounds etc.			Specification 111.10
		Provide proper drainage facility so that the sites do not contaminate any water sources, rivers etc.	Contractor	CSC & PMT	MoRTH Specification 111.1
B.2.6	Roadside plantation and landscaping	The compensatory avenue plantation shall be taken up at the onset of monsoon season as per IRC: SP 21-2009 "Guidelines on Landscaping and Tree Plantation" and in consultation with the State Forest Department. Compensatory tree plantation at a rate of three per each tree removed.	Contractor	CSC & PMT	MoRTH Specification 111.1
		Debris to be disposed off in the sites identified for the same as per guidelines in **Annexure 3.5.**	Contractor	CSC & PMT	MoRTH Specification 111.10
C. Post construction / Operational Phase					
C.1.	Redevelopment of construction and labour camp sites, quarry and crusher sites, borrow areas.	**Mitigation Measures for Impacts on Land and Water**			
		Should be undertaken depending on the type of redevelopment envisaged in the redevelopment plan.	Contractor	CSC / PMT	MoRTH Specification 111.2 and 111.3
		All the temporary structures should be cleared as per redevelopment plan. All building debris, garbage, night soils and POL waste should be disposed off safely and the site should be fully cleaned before handing over. All disposal pits or trenches should be filled, disinfected and effectively sealed off.	Contractor	CSC / PMT	MoRTH Specification 111.1, 111.2 and 111.3

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
		Plantation along the boundary, erosion control measures, leveling or slope stabilization measures should be undertaken based on the activities envisaged in redevelopment plans approved by the CSC.	Contractor	CSC / PMT	MoRTH Specification 111.3 and 111.2
		All measures envisaged in redevelopment plans approved by the CSC shall be undertaken.	Contractor	CSC / PMT	MoRTH Specification 111.1
		Mitigation Measures for Impacts on water			
		Based on the quarry redevelopment plan approved by the CSC necessary development activity like water recharging or developing it into a fishing pond shall be undertaken.	Contractor	CSC / PMT	MoRTH Specification 111.3
		Depending upon the type and form of rehabilitation to be adopted slope stabilization measures and small bund creations may be undertaken in borrow areas.	Contractor	CSC / PMT	MoRTH Specification 111.2
		Mitigation Measures for Impacts on Biological Environment			
		Plantations along the boundary shall be undertaken. Surplus trees after avenue plantation will be utilized for green belt development of exhausted borrow areas.	Contractor	CSC / PMT	MoRTH Specification 111.1
		Mitigation Measures for Socio-economic Impacts			
		Involve local community in the implementation of redevelopment plan of quarry sites and borrow areas.	Contractor	CSC / PMT	MoRTH Specification 111.3
C.2.	Operationalisation of the project stretch	Regular maintenance of plantations especially during summer season until defect liability period gets over.	Contractor	PMT	MoRTH Specification 111.1
		Necessary signboards should be put up to inform the public about the restrictions on horn at sensitive locations like schools and hospitals along the road.	Contractor	PMT	MoRTH Specification 111.1

Table 3.3. Part-I Link Specific Environmental Management Action Plan for PMT, CSC and Others

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
A. Design / Project Preparation Phase					
A.1.	Preparation of DPR	Cultural properties along the alignment were identified. Religious structures were avoided by adjustment of alignment. (Refer **Annexure 3.55**).	Design Consultant	PMT	EMAP
		Issues raised in public consultations were examined and suitably incorporated based on merit. These include parking areas and other road safety measures.	Design Consultant	PMT	EMAP
		Loss of existing bus stops and waiting shed facilities were addressed by suitably relocating or integrating them to the design (Refer **Annexure 3.43**). Bus lay bys and bus waiting shed designs are provided in **Annexure 3.53.**	Design Consultant	PMT	EMAP
		Accident black spots were addressed by improving the road surface, road geometry, pedestrian facilities and bus bays. (For bus bay details refer **Annexure - 3.43**). Signages were given a high priority for all road junctions.	Design Consultant	PMT	EMAP
B. Pre-Construction Phase					
B.1	Clearing the site	All the cultural properties and common property resources being impacted due to the project should be relocated with prior approval of the concerned community / departments/ agencies before starting the construction. (Refer **Annexure 3.55**).	PMT	-	NA
B.2.	Clearing of Avenue Trees	Chainage wise number of trees to be felled for the corridor is shown in **Annexure 3.49.** Small trees shall be suitably transplanted to nearby puramboke land	PMT	-	BOQ No. 2

Table 3.4. Part-II Link Specific Environmental Management Action Plan for Contractor

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
A. Construction Phase					
A.1. Site Preparation Activities					
A.1.1.	Material sources	**Mitigation Measures for Impact on Land and Water**			
		Sourcing of materials from approved sources as per **Annexure 3.47 and 3.48.**	Contractor	CSC	EMAP
A.2. Construction Activities					
A.2.1.	All types of construction activities including compacting earth, laying of sub-base course, base course, construction of bridges, culverts, ROB, other structures etc.	**Mitigation Measures for Impacts on Land and Water**			
		Retaining walls with cross drainage structures to be constructed at locations given in **Annexure 3.41**, where there are filling of low lying areas and construction of embankments.	Contractor	CSC	BOQ No. 3 ED. No. TD-2D-80-003-01
		The foundation area should be separated from other areas with an impervious barrier. This barrier will act as a settling tank for the solids and will prevent substantial increase in the turbidity of surrounding water. The sludge should be removed periodically and disposed off in the selected construction debris disposal sites. This has to be taken care of at locations given in **Annexure 3.46**, where there are water bodies and at locations given in **Annexure 3.41,** where there are filling of low lying areas and construction of embankments.	Contractor	CSC	EMAP
		At locations where the proposed road crosses water body enhancement measures should be undertaken. (refer **Annexure 3.46**).	Contractor	CSC	BOQ No. 11
		To reduce flooding and water logging, the cross drainage structures should be provided at locations given in **Annexure 3.41** and **Annexure 3.45**.	Contractor	CSC	BOQ No. 3 ED. No. TD-2D-10-001-01 to 04, TD-2D-12-001-01 to 05, TD-2D-80-005-01 and TD-2D-80-

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
					006-01.
		Water quality monitoring shall be conducted along project stretch as per Environmental Monitoring Plan so that appropriate measures are taken up towards abatement of pollution.	Contractor	CSC	BOQ No. 11
		Mitigation Measures for Impacts on Air			
		Air quality monitoring shall be conducted along project stretch as per Environmental Monitoring Plan so that appropriate measures are taken up towards abatement of pollution.	Contractor	CSC	BOQ No. 11
	All types of construction activities including compacting earth, laying of sub-base course, base course, construction of bridges, culverts, ROB, other structures etc. (Contd.)	Air quality monitoring shall be conducted at the site of project facilities as per Environmental Monitoring Plan so that appropriate measures are taken up towards abatement of pollution.	Contractor	CSC	BOQ No. 11
		Mitigation Measures for Impacts on Noise			
		Near sensitive receptors as listed in **Annexure 3.44** use temporary noise barriers and avoid work at night.	Contractor	CSC	EMAP
		Construction of noise barriers (stone walls and planting) for silence zones including schools and hospital. [Refer **Annexure 3.44**]. Design for noise barrier provided in **Annexure 3.53**.	Contractor	CSC	BOQ No. 11 Engg. Drg No. PT-1D-60-008
		Noise quality monitoring shall be conducted at the site of project facilities as per Environmental Monitoring Plan so that appropriate measures are taken up towards abatement of pollution.	Contractor	CSC	EMAP
		Mitigation Measures for Impacts on Biological Environment			
		Compensatory tree planting at the rate of three per each tree removed. (refer .**Annexure 3.49** for details of tree removal). List of indigenous tree and shrub species is shown in **Table 3.0** and **4.0** in **Annexure 3.50**. The project tree planting strategy is provided in **Annexure 3.50.**	Contractor	PMT	BOQ No. 11
		Tree planting in oxbow land without access control at location given in **Table 5.0** in **Annexure 3.50** (Also refer **Annexure 3.53).**	Contractor	PMT	BOQ No. 11 Engg. Drg No. PT-1D-60-002.

Sl. No.	Activity	Management and Mitigation Measures	Implementing Organisation	Monitoring Organisation	Reference
		Mitigation Measures for Socio-Economic Impact			
		Bus shelters and bus laybyes should be constructed at locations identified in **Annexure 3.43** and **Annexure 3.53**.	Contractor	PMT	BOQ No. 11 Engg. Drg No. PT-1D-60-009 & 007
		Information boards showing name of rivers, pilgrim sites, tourist locations as per the environmental enhancements (Refer **Annexure Annexure 3.55**).	Contractor	PMT	BOQ No. 11

Chapter 4. Arrangements for the Implementation of EMAP

The Environmental Management Action Plan (EMAP) (Provided as **Table 3.1 to Table 3.4),** which is an integral part of the Environmental Management Plan, identify the detailed impacts, propose the mitigation actions, mention the implementing organization and monitoring organization. The responsibility for the implementation of EMP involves a number of parties, each with specific responsibilities. They are listed as follows:

- Project Management Team (PMT), that represents GoK and is directly responsible for implementing the project
- Construction Supervision Consultant (CSC), who will be in charge of supervising the Contractor
- Construction Contractor, who is in charge of undertaking road construction work.

This chapter looks into the organisation and staffing of each of these stakeholders along with their responsibilities.

4.1. Organisation, Staffing and Responsibilities of PMT

Project Management Team (PMT) for the project under scrutiny is KSTP, which is a part of the Public Works Department (PWD) and as project proponents, are responsible for the implementation of all road improvement works and environmental management activities. The KSTP is executing the project work under the guidance of Project Director (PD) as its head. The Project Director is assisted on all technical issues by one Chief Engineer (Projects), one Superintendent Engineer, one Executive Engineer (Environment) and sociologist and Assistant Executive Engineer and Assistant Engineers. The PMT is having five field divisions comprising of one Executive Engineer (R&R Officer), 2 Assistant Executive Engineers and 9 Assistant Engineers and other supporting staff which will play a key role in implementation of EMP and R&R. The team will oversee the project related management activities of the project including the overall control of construction activities and implementation of contracts.

The implementation of mitigating measures requires supervision from adequately trained staff within the PWD. The institutional organisation for EMP implementation is shown in **Figure 4.1** and **Figure 4.2** shows a very flexible and practical Environmental Management Unit (EMU). The detailed structure of KSTP is separately captured in **Figure 4.3.**

Responsibilities of Chief Engineer in PWD: S/he is responsible for acquisition of all necessary right-of-way (ROW) land and buildings, review and approval of detailed road designs, obtaining all necessary clearances for construction and related activities, review and approval of the road realignments and road works (including retaining walls and excavation sites) and liasoning with supervision consultants.

Responsibilities of Chief Engineer: The Environmental Engineer (EE) of KSTP Project Management Team (PMT) assists the Chief Engineer in the overseeing of environmental aspects of the construction contracts, including the enforcement of all monitoring provisions, and advice on the locations of construction and labour camps, etc. He is also familiar with the Indian environmental legislation, environmental monitoring, EMP implementation aspects etc. The Environmental engineer shall oversee day to day implementation of the environmental management plans pertaining to the construction contract for various road links and is also

responsible for monitoring reports to World Bank. Additional recruitment if needed will be undertaken as necessary on contract basis.

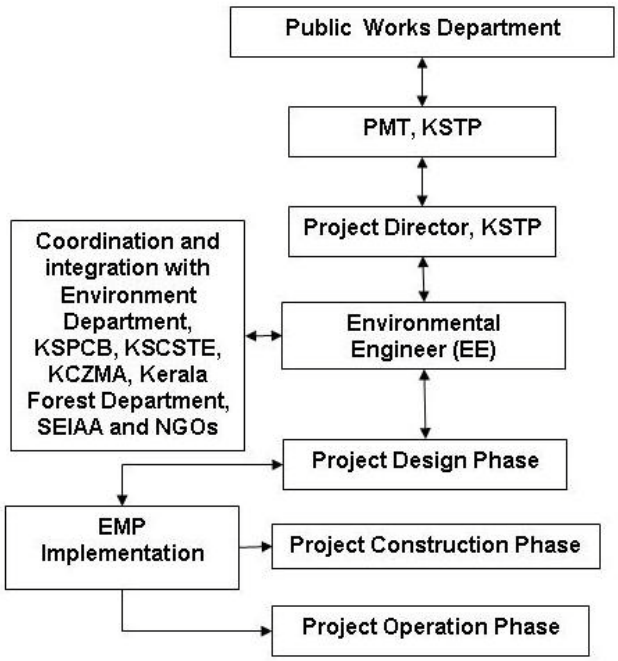


Figure 4.1. Institutional Organisation for KSTP EMP Implementation

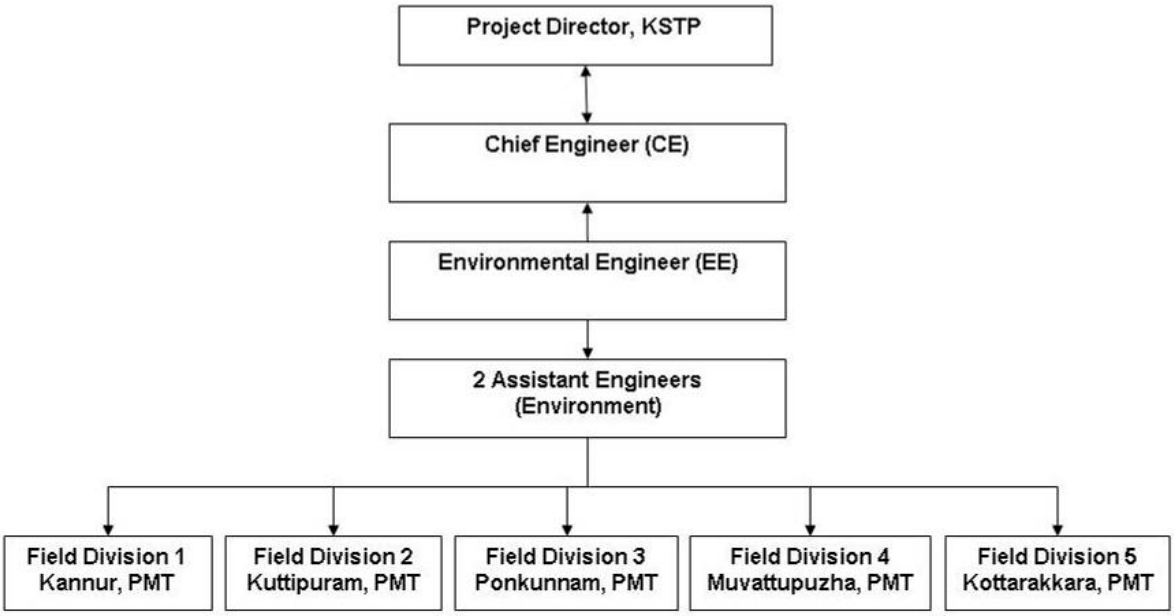


Figure 4.2. Environmental Management Unit (EMU)

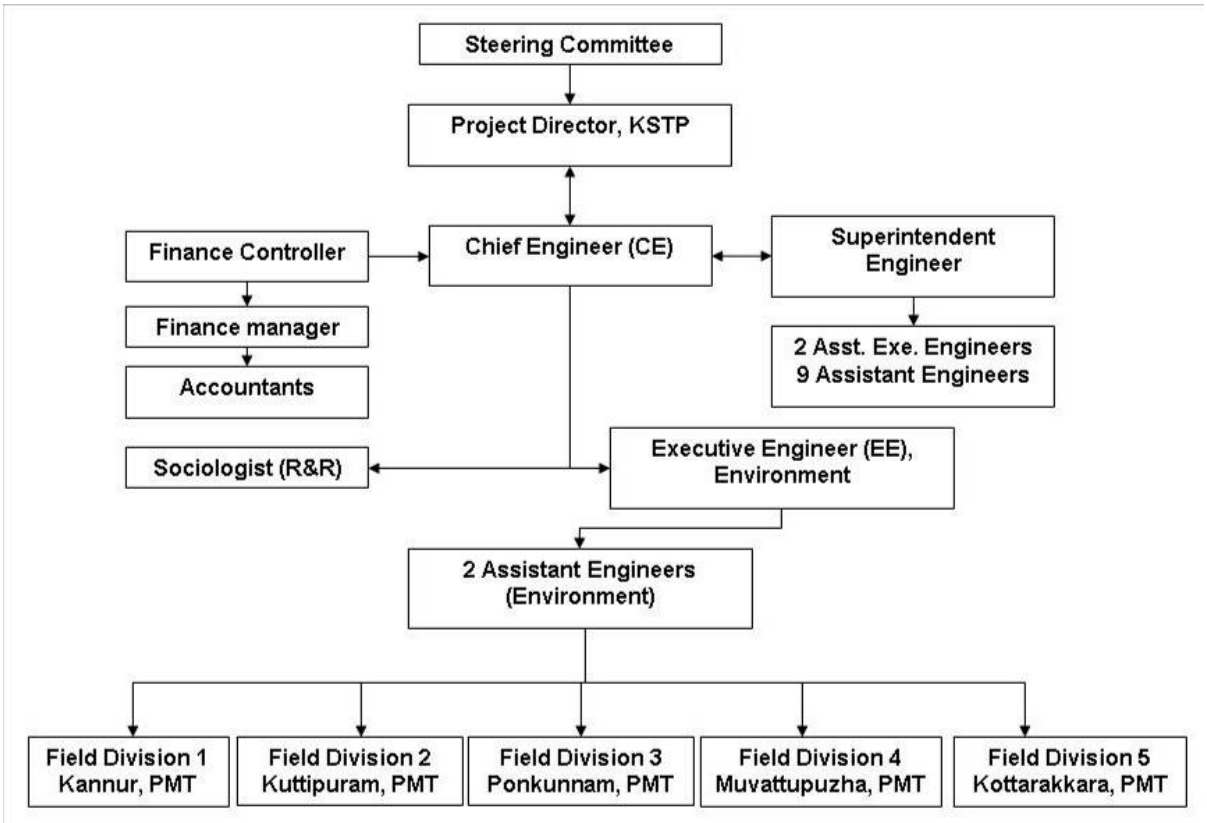


Figure 4.3. Organisation Structure, KSTP

The main duties of the Environmental Engineer will include:

- Collection and dissemination of relevant environmental documents including amendments to environmental protection acts issued by the Government and various agencies such as the World Bank, Asian Development Bank (ADB) and other organisations.
- Co-ordination with non-government organisations (NGOs), community groups, government departments, etc. on environmental issues and obtaining the necessary clearances from the regulatory authorities.
- Monitoring the environmental aspects of the project during construction to ensure that the environmental requirements of the contract and the mitigation measures proposed in the EMP are implemented.
- Advising the Engineer and preparing the environmental input for the monthly progress report.
- Development of guidelines or a code of good practice on low-cost environmental measures that can be implemented in the road construction and maintenance programs for the Public Works Department.
- Development of environmental training activities for Contractors and Construction Supervision Consultant staff.
- Assistance to local governments in the restoration of the environmentally degraded portions of any existing Right-of-Way, which may revert to their control due to the construction of realignments.
- Promotion of the policies adopted for the development of roadside amenities

- Assistance with the road safety components and issues related to the effects of roadside environment on road safety and non-motorised traffic.
- Laison with the EO of CSC and report to Superintending Engineer on all matters related to implementation of the Environmental Management Plan.
- Issuing completion certificate for constructed road works for payment.

4.2. Organisation, Staffing and Responsibilities of Construction Supervision Consultant (CSC)

The Construction Supervision Consultant will supervise the activities of the construction Contractor on behalf of Kerala State Public Works Department and will be reporting directly to the Superintending Engineer. The Construction Supervision Consultant will be responsible for the technical supervision of road layout, overseeing contract implementation and certifying works for payment.

The roles of Construction Supervision Consultant is described below:

- Supervision of the Contractor to ensure that work is undertaken according to the construction contract.
- Inspection and reporting of Contractor activities to ensure effective implementation of the EMP.
- Auditing of Contractor works and activities against the conditions put forward in the EMP.
- Issuing corrective action, requests and conduct follow up inspections and evaluation.
- Reporting any exceptions to the Project Director.
- Certifying completed constructed road works for payment.

The Construction Supervision Consultant will have all the required specialists including an Environmental officer (EO) and a Senior Construction Safety Specialist. The brief description of qualifications, duties and responsibilities of the Team Leader, Senior Construction Safety Specialist and Environmental Officer of the Construction Supervision Consultant (CSC) are as follows:

Qualifications, roles and responsibilities of Team Leader: He shall be at least a graduate in Civil Engineering, with atleast at least 20 years of professional experience out of which he should have worked as Team Leader/Project Manager or equivalent for minimum 4 years on supervision/construction of highway projects, preferably involving flexible pavements. Post Graduate qualification in civil engineering is desirable. His roles and responsibilities shall be as follows:

- He will be overall in-charge of the project supervision team.
- He shall be responsible for the overall implementation activities.
- He shall be assisted by key Professionals and other support Staff.
- He shall coordinate with the subordinate team to ensure that the construction process is well controlled as per established Procedures.
- He will interact with the client.

Qualifications, roles and responsibilities of Senior Construction Safety Specialist (SCSS): The candidate shall be at least a Graduate in civil engineering and preferably with post graduate qualification in Industrial and Construction safety. OSHAS certification will be mandatory. S/he needs a minimum of 10 years of relevant professional experience, out of which, s/he should have worked for at least 5 years at a road / bridge construction site in the capacity of a safety

engineer. Experience in working on height / deep foundations and live traffic situation and imparting safety training to construction managers and workers will be highly desirable.

- The SCSS will report to the Team leader of the Construction Supervision Team.
- S/he will be responsible for reviewing and approving the construction zone safety plans and traffic management including all temporary works/staging along with the structural or bridge engineer to confirm the safety point of view.
- The Safety Specialist will be reponsible to guide the field supervision team and Contractors site officers and should confirm whether safety measurements implemented in the field are complying with safety standards.
- The safety specialist must report any job accident or safety violation to the concerned officials through team leader. When an employee is injured on the job, the construction safety officer will investigate the accident and handle any workers' compensation claims.
- The safety specialist shall teach proper safety and health procedures to the entire construction workers. Also, he should take intiatives to conduct training programmes and moke safety drills which will help to update safety procedures as well as the importance of reporting a safety concern or injury.

Qualifications, roles and responsibilities of Environment Officer (EO) of CSC: The candidate shall be M. Sc. Environmental Science or graduate in Civil / Environmental Engineering. The candidate shall have professional experience of at least 5 years relevant to environmental management in infrastructure projects. Experience in implementation of EMP in externally aided/FIDIC based major highway projects is preferable. He should have adequate experience in implementing EMPs and organizing training to Contractor's and Employer's staff. He should be familiar with requisite procedures involved in obtaining and implementing environmental clearance requirements for project roads.

- The Environmental Officer (EO) will report to the Team leader of the Construction Supervision Consultant Team. The EO shall not instruct or direct the Contractor or Contractor's men but can discuss various issues and environmental mitigation measures with all concerned directly or indirectly.
- All matters related to environmental and social activities within the ROW such as latest EIA, SEA, RAP and other related documents should be available to the EO immediately after mobilisation. The CRZ, Forest, environmental clearance, Kerala State Pollution Controll Board's clearance conditions and other approval status should be specified. A status report prepared by PCC/ESMC of PMT would be required for the EO to start the work.
- The Environmental Officer (EO) should be mobilised during the early stages of construction. This is to help the Contractor in identifying environmentally sound locations for Construction camps, hot mix plant, WMM plant and all other issues according to the Environmental Management Action Plan (EMAP).
- The important role of EO during construction is to ensure the smooth implementation of EMAP and to address direct and indirect social issues arising out of implementation of the RAP.
- The EO should visit incomplete construction work sites where there are no Contractor's current activities, active construction work sites and completed areas of the work sites and conduct regular meetings with the Contractor in identifying gaps pertaining to both environment and contruction safety. The EO will also visit the hot mix plant; quarries and crushers, borrow areas and others as per the necessity. EO has to ensure appropriate corrective and preventive action to the identified gaps in

construction site in environmental aspects. Conduct regular meeting on environmental aspects with Environmental and Social Management Unit in PWD.

- The EO will assist the Engineer to ensure environmentally sound engineering practices. In addition, other specialists of the engineers team may also act and report on road safety related issues.
- The EO will carry out consultation with the Contractor, Contractors men, local Project Affected People (PAPs) and interest groups. The EO will also consult with NGOs to consider any problems (e.g. access problem to school, buildings, houses and business establishments) arising from construction activities.
- The EO will assist in the compliance with various labour laws including the payment of minimum wages to the individual contract labourer's especially 'unskilled illiterate migrant labourers'. This has a direct bearing on the health and safety of the workers.
- The EO will assist the Contractor, and the Public Works Department in all matters related to public contacts including consultation, training and public relations.
- The EO will prepare standard formats (if available they may be obtained from other projects that are being implemented or are completed recently) for the compliance of the environmental and social requirements.
- The EO will ensure the procurement of materials that are included in the Bill of Quantities relating to environmental and social mitigation costs.
- The EO will assist the PWD and the Contractor in all training activities during construction supervision period.
- The EO will prepare and submit a regular reports to the team leader of CSC.
- The EO will assist the various Environmental monitoring activities of the Contractor / PWD.
- The EO will be responsible to confirm whether the Contractor has received all certifications in different sectors from the concerned authority to proceed the work.
- The EO in cooperation with the EO of PMT and Superintending Engineer will make sure the issuing of timely Work order for the Nurseries to be raised according to the '*Landscaping, Tree planting and Environmental Enhancement Plan'*. This will allow one year for the plants to attains the required size.

4.3. Organisation, Staffing and Responsibilities of Construction Contractor

The construction Contractor shall be responsible for undertaking all duties and works assigned in the road construction contract, including all specified conditions in the EMAP. The construction Contractor should prepare an implementation plan of mitigating actions specified in the EMAP Table. The Contractor will work closely with the Construction Supervision Consultant to ensure that works are constructed to standard. Throughout this EMP, the construction Contractor is referred to as the 'Contractor' and the supervising Consultant is referred to as the 'Construction Supervision Consultant' (CSC). Detailed staffing pattern in the Contractor's office is given below in **Table 4.1**.

Table 4.1. Staffing Pattern in Contractor's Office

Sl. No.	Designation	Nos.
1	Contract Manager	1
2	Construction Planning Engineer	1
3	Site Engineer	4
4	Quality Control/Material Engineer	1
5	Bridge Engineer	1

Sl. No.	Designation	Nos.
6	Earth Works Supervisor	6
7	Pavement Supervisor	2
8	Environmental Engineer	1

Roles and Responsibilities of Team Leader of Contractor: The Team Leader of the Contractor shall be responsible for the timely implementation of EMP, as per the conditions stipulated in the Environmental Management Action Plan. S/he shall prepare an implementation plan of mitigating actions specified in the EMAP Table. H/she shall guide / supervise the ESE in ensuring that all construction work is undertaken in line with the requirements of EMP. The team leader shall ensure that the reporting procedures mentioned in EMAP and detailed out in Chapter 5 of this report is adhered to and required reports and management plans are submitted to CSC on time. The corrective actions, as suggested by CSC shall also be implemented and reported. S/he shall have good understanding of the contractual clauses, especially the penalty clause given in sub clause 14.6 of the bid document as well as Chapter-3 of this report. He also has to ensure that the responsibilities stipulated in EMAP for Defect Liability period are carried out[4].

Qualifications, Roles and Responsibilities of Environment and Safety Engineer (ESE) of Contractor: The candidate shall be M. Sc. Environmental Science or B.Tech. in Civil / Environmental Engineering with two years field experience in environmental management of transportation projects.

The duties and responsibilities of the Environment and Safety Engineer in the Contractor's team[5] are as follows:

1. To ensure that all the Contractor activities are done in line with the EMP requirements.
2. To have good understanding of the contractual clauses, especially the penalty clause given in sub clause 14.6 of the bid document as well as Chapter-3 of this report.
3. To verify the appropriateness of all the EMP items.
4. To prepare a management and redevelopment plan for all the sites of identified project related ancillary facilities like (i) Construction camp, (ii) labour camp, (iii) quarry and stone crusher unit, (iv) borrow area and (v) debris disposal site in line with detailed guidelines given in EMP.
5. To ensure that all the five sites and camps mentioned activity is operated, managed and closed in line with management and redevelopment plan.
6. To ensure that the top soil preservation is done wherever required as per the guidelines.
7. To ensure the adoption of proper waste management practices in the plant sites, labour camps, construction camps and along the road (also pertains to the proper disposal of bituminous / concrete waste generated during construction).
8. To ensure that the Contractor does not violate any social norms such as employment of child labour, children at work sites, providing creches, unhygienic working conditions and minimum wage considerations as per prevailing laws
9. To ensure that all the MORTH specifications are available and followed in all the Contractor activities.
10. To liaison with the Supervision Consultant and the PMT / PWD on matters pertaining to the EMP.

[4] No full time engineer is required for this, any one in the Contractor's team shall be given this responsibility.

[5] The Contractor will need a dedicated civil engineer to address EMF and safety-related issues for each contract package. This engineer will be given appropriate logistical support to carry out the various activities

11. To liaison with Government Agencies such as the Pollution Control Boards and Forest Department in order to obtain the required clearances, and to ensure that the Contractor activities are carried out in line with any conditions placed.
12. To ensure adoption of good construction-related safety practices and appropriate traffic management practices to ensure road safety during the construction phase.
13. To prepare and implement a plan for road safety, accidents and traffic management.
14. To demark the starting chainage & end chainage of the project as the construction zone, and provide sign boards as per accepted standards.
15. To inform and train all the Contractor personnel on the IRC requirements on construction safety and on road safety.
16. To ensure the availability of first aid facilities.

ISO requirements of Contractor: All construction sites of the Contractor shall comply with Environmental Management System - ISO 14001 requirements within one year from the award of the contract based on the Environmental Health & Safety Management System and obtain ISO 14001 certificate. The Contractor shall have a documented quality management system (QMS) for all construction sites within one year from the award of the contract based on the requirements of ISO 9001: 2008 and obtain the certificate. The Contractor shall also establish and maintain an Occupational Health and Safety Management system complying with ISO 18001 and obtain the certificate for all construction sites within one year from the award of the contract.

Reporting requirements of Contractor: The Contractor shall undertake regular reporting to CSC, comprising submission of reports as well as management and redevelopment plans to CSC as detailed in the Chapter -5 of this EMP.

4.4. Information Dissemination

Information dissemination shall be undertaken by PMT at a macro level and by the Contractor in the project site at micro level. The wider dissemination of information to public shall be undertaken by PMT through the disclosure of EIA / EMP reports in the website of PMT. At the project site, i.e. the direct impact zone, information boards shall be displayed at critical and pre-identified locations to disseminate the project details. Such information boards shall display project name, Contractor's name, concerned official's name in Contractor's office with his designation and contact no., name and contact details of an authorised official in local PWD divisional office. These information boards shall be approximately of size 5' x 5' and shall be designed and put up in such a way that public can easily read it from a distance. Such boards shall be setup, not only along active project stretches, but also at the sites of construction camps and labour camps and other project facilities like borrow area, quarry and stone crusher site and debris disposal site. These information boards shall also mention the availability of a complaint register with ESE of the Contractor. Under the RTI Act, 2005, Contractor is also duty bound to share any information demanded by the public, pertaining to any aspect of the project, as and when it is demanded.

4.5. Grievance Redressal Mechanism

Public Complaint Cell in PWD: In order to create a responsive and transparent information landscape for the PWD, a Public Information Cell has been set up vide G.O. No. 26170/D3/2009/PWD dated 21-11-2009 to serve as a point of contact to provide information to the public and the media about the goals, policies and activities of the PWD. The PI Cell operating from within the PWD is serving as an active link for gathering and disseminating

information about the PWD. Events such as workshops, seminars, campaigns and training programs are also part of a wider agenda of the PI Cell.

Under Public Information Cell, a helpline desk was established with a toll-free Phone Number 18004257771, with 2 operators for attending calls during all working days and dedicated software to register complaints online with various monitoring and evaluation features. This software is integrated with the PWD website. This was part of institutional strengthening process of PWD funded by World Bank and is being operated by Public Information Cell situated at KSTP.

Around 250 mobile phones with connections was distributed for all AEEs of different wings to speed up the process of Grievance redressal the Asst. Executive Engineers are contacted by the helpline desk operator over phone and informed about the complaint received. Such complaints are forwarded by the operator to the mobile phone of concerned Asst. Executive Engineers based on the seriousness of the complaint, the concerned officer will immediately contact the complainant and discuss about the issue and take follow up actions. The Asst. Executive Engineer is liable to contact the complainant within 48 hours. Once the complaint is made, a registration number is issued to the complainant. A weekly report is also sent from all concerned officers with details of the complaints received and action taken to the PI cell. Apart from this, a media desk was set up with senior journalists for reviewing all major newspapers.

Complaints register with Contractor: The Contractor shall keep and maintain a complaint register report at his site office along the project road as well as project facilities like construction camp, labour camp etc., for public to register their complaints. The format for same is given in **Annexure 3.18** in the EMAP table. The Contractor, after taking necessary action based on the complaint, shall also incorporate the same in the complaint register. This report shall also be part of the monthly report, for CSC to monitor and take necessary action, if needed. It has to be noted that, inaction upon the complaint of the public shall be considered as a major lapse from the side of the Contractor, leading to invoking of penalty clause, which is given in Chapter 3 of this report as well as the Contract document.

4.6. Training Programme on Environmental Aspects

Training is an investment made on the human resource of the organization to provide and tone the competencies, required to do an existing job well and also to perform for future needs. Targeted and monitored training can set up an environment of good morale and productivity and contributes in creating a powerhouse of competencies for the organisation. This section deals with the training to be imparted to the Contractor's staff by the EO and SCSS of CSC for ensuring effective implementation of EMP. The training requirement could be broadly identified as given in **Table 4.2** below.

Table 4.2. Training Programme to the Contractor's Staff

Programme	Particulars	Duration	Participants
Orientation Programme	Contractor's Responsibility as per bid document Reporting System in EMAP	One day each	Engineers including ESE
Awareness programme	General Awareness on Environment General Awareness on Safety aspects	One day each	Skilled and unskilled labourers
			Engineers, supervisors and office staff

The need for additional and specialised training shall be examined and appropriate training will be undertaken as required.

Chapter 5. Environmental Monitoring & Reporting Requirements

5.1. Monitoring and Reporting of Environmental Management Measures

A robust monitoring and reporting system is mandatory to ensure compliance to EMAP by the Contractor. The monitoring and reporting system evolved for KSTP-II is shown in **Table 5.1** and is integrated into EMAP table and its annexures. It comprises following three parts:

(A) Monitoring and reporting of environmental management measures for project related facilities like construction camp, labour camp, quarry area, borrow area and debris disposal site,

(B) Monitoring and reporting of environmental management measures for overall project, and

(C) Monitoring and reporting of quality of environmental parameters like air, water and noise.

This monitoring and reporting system attempts to pre-empt much of the environmental issues created during construction and post construction stages and provides the necessary feedback for CSC / PMT to make sure that EMAP is implemented in full spirit. Instead of a linear reporting system, this system works on a two way basis – initial reporting by Contractor followed by monitoring by CSC based on Contractor's reports. Responsibilities for monitoring will rest with the Environmental Officer of the Supervising Consultant reporting to the PMT and EMU at KSTP.

The detailed procedure of reporting and monitoring system is as follows:

(A) Monitoring and Reporting of Environmental Management Measures for Project Related Facilities

Sage I – Site Identification: While initiating the project, the Contractor needs to identify suitable sites for project related ancillary facilities like construction camp, labour camp, quarry and stone crusher units, borrow area, debris disposal sites and sources of water for construction. The same shall be undertaken adhering to the criteria given in the respective guidelines for each of these sites given in **Annexures 3.1** to **3.5**. Once the site is identified by the Contractor, s/he shall prepare a site identification report furnishing all the details pertaining to the identified site using the reporting format given in **Annexures 3.12 to 3.17** and submit it to the CSC. Subsequently, the EO of CSC has to visit each site and approve / reject the site with reasons. The EO of CSC has to give a copy of this format to the Contractor after his approval / rejection with remarks. This reporting procedure needs to be undertaken for each and every parcel of land identified for any of the project related ancillary facility.

Stage II – Setting up of Sites: On approval of a site, the Contractor has to prepare the Management and Redevelopment Plan for this site as per the relevant Guidelines given in **Annexures 3.1** to **3.5** of EMP and submit to CSC for approval. In addition to the Management and Redevelopment Plans for sites, the Contractor has to prepare Comprehensive Waste Management Plan, Occupational Health and Safety Management Plan, Traffic Management Plan and Hazardous Substances Management Plan for all sites together, as per the Guidelines given in EMP **Annexure 3.6**, **3.9**, **3.10** and **3.11** respectively. Subsequently, the EO of CSC needs to visit each site and approve the Management Plan. The EO of CSC has to give a copy of this management plan to the Contractor after his approval with remarks / suggestions for additional mitigation measures. Any kind of activity could be initiated in a site only after getting approval

from CSC for the Management and Redevelopment Plan for that site. These plans need to be prepared for each and every parcel of land identified as described above.

Stage III –Operation of Sites: Once the Contractor receives approval for the Management and Redevelopment Plan, s/he can initiate activities on the site. All the activities shall be undertaken strictly in line with the said plan. CSC shall monitor the implementation of management plan monthly once, through site visits and the Checklists for Monitoring the Environmental Management of Sites / Camps given in **Annexures 3.20 to 3.24.** Corrective actions with specific timeframe should be proposed for each environmental management measure, which is not implemented satisfactorily. A copy of the filled up checklist should be given to the ESE of the Contractor. CSC has to attach this format to the monthly Report to be submitted to PMT, with details of corrective action taken by the Contractor.

A Register of Sites Opened and Closed in the format given in **Annexure 3.19** should be maintained by the Contractor (preferably in A3 size paper) for each road. Details of each site opened should be entered in this register in chronological order. When ever a site is closed, it should be recorded in this register with status of redevelopment. Clearances applicable for each site and the status of clearances should also be entered in this register. This same format shall be used to report the details of sites opened and closed to the CSC along with the Monthly Report of the Contractor. EO of CSC has to visit the sites, verify the details and approve the report with instruction to the Contractor if any clearance is pending for any site or redevelopment is not done satisfactorily for any closed site. .A copy of the approved report with CSC's remarks should be given to the ESE of the Contractor. The EO of CSC has to attach this format to the monthly Report to be submitted to PMT, with details of corrective action taken by the Contractor.

Stage IV – Closure of Sites: Upon completion of the operation in any particular project ancillary facility site, the Contractor shall undertake redevelopment of the same, in line with the redevelopment plan which was already approved by CSC and intimate to CSC through the format for Register of Sites Opened and Closed. The Environmental Officer of the CSC shall monitor the same through site visit and the Checklists for Monitoring the Redevelopment of Sites / Camps provided in **Annexures 3.25 to 3.29** as and when a site is closed and reported by the Contractor. Corrective actions with specific timeframe should be proposed for each environmental management measure, which is not implemented satisfactorily. A copy of the filled up checklist should be given to the ESE of the Contractor. CSC has to attach this format to the Monthly Report to be submitted to PMT, with details of corrective action taken by the Contractor.

As described above, the reporting tasks for project facilities have been split and shared among Contractor and CSC and its summary is given below:

- One time reporting by Contractor to CSC at the stage of identification of sites and camps
- One time reporting by Contractor to CSC through management and redevelopment plans before setting up of sites and camps.
- Monthly reporting of sites opened and closed by Contractor to CSC
- Monthly monitoring by CSC during the operation stage of sites and camps
- One time monitoring by CSC after the closure of each site and camp

(B) Monitoring and Reporting of Environmental Management Measures for Overall Project

The Contractor shall undertake regular monthly reporting to CSC using the format given in **Annexure 3.38,** and all other reporting formats shall be attached to this monthly report as annexures. The Monthly Report captures the physical progress of the work, main issues / concerns, corrective actions taken, no. of workers in the reporting month etc. Further, CSC shall report monthly to PMT, summarising the issues / concerns and actions taken. This report has to be prepared in the format given in **Annexure 3.39** and all other reports are to be attached to it as annexures. All the reporting formats given in **Annexures 3.30** to **3.39** shall be used by the Contractor to report environmental management measures related to various aspects of the overall project. These reports are to be submitted monthly by the Contractor to the CSC. The EO of CSC shall visit the sites and verify the implementation of management measures and approve the reports. EO of CSC should give a copy of the approved reports to the ESE of the Contractor with his remarks.

(C) Monitoring and Reporting of Environmental Quality

Environmental quality monitoring shall be undertaken by the Contractor through an NABL approved Laboratory, based on the Environmental Quality Monitoring Plan presented in **Table 5.2**. The monitoring results shall be reported by the Contractor to the CSC in the Reporting Format for Environmental Quality Monitoring given in **Annexure 3.35** along with the Monthly Report, if monitoring was due in that month. A copy of the monitoring report given by the Laboratory has to be attached to this format. The CSC has to visit the sites and verify the details. Additional mitigation measures, if required, can be suggested by the CSC. The EO of CSC has to give back a copy of this format to the Contractor after his approval with remarks.

Table 5.1. Monitoring and Reporting Plan for Entire Project

reporting / Monitoring format	Applicable Project Site	Frequency of reporting by Contractor	Frequency of reporting / Action to be taken by CSC	Applicable annexure no.
A. For project related facilities and sites				
Stage-I. Site identification				
Reporting Formats for Identification of Sites	Construction camp	One time reporting to CSC for each site, as and when it is identified.	Visit each site and approve the site as and when it is reported	Annexure No. 3.12
	Labour camp			Annexure No. 3.13
	Quarry and stone crusher unit			Annexure No. 3.14
	Borrow area			Annexure No. 3.15
	Debris disposal site			Annexure No. 3.16
	Water Sources			Annexure No. 3.17
Stage-II. Setting up of sites				
Management and Re-development Plans for Sites / Camps	Construction camp	One time reporting to CSC for each site, and when it is required.	Visit each site and approve the management plans as and when it is submitted	Annexure No.3.1
	Labour camp			Annexure No.3.2
	Quarry and stone crusher unit			Annexure No.3.3
	Borrow area			Annexure No.3.4
	Debris disposal site			Annexure No.3.5
Comprehensive Waste Management Plan	All Sites	One time reporting to CSC for all sites together	Visit each site and approve the management plan as and when it is submitted	Annexure No.3.6
Occupational Health and Safety Management Plan	All Sites	One time reporting to CSC for all sites together	Visit each site and approve the management plan as and when it is submitted	Annexure No.3.9
Traffic Management Plan	All Sites	One time reporting to CSC for all sites together	Visit each site and approve the management plan as and when it is submitted	Annexure No.3.10
Hazardous Substances Management Plan	All Sites	One time reporting to CSC for all sites together	Visit each site and approve the management plan as and when it is submitted	Annexure No.3.11

reporting / Monitoring format	Applicable Project Site	Frequency of reporting by Contractor	Frequency of reporting / Action to be taken by CSC	Applicable annexure no.
Stage-III. Operation of sites				
Format for Register of sites opened and closed and its reporting	All sites / camps	Details to be recorded in chronological order as and when a site is opened / closed. To be submitted to CSC monthly.	Check the status of clearances and redevelopment status of each site and approve the report monthly.	Annexure No. 3.19
Checklists for Monitoring Environmental Management of Sites / Camps	Construction camp	Nil	Monitor the implementation of management plan monthly once, through site visits and checklists.	Annexure No. 3.20
	Labour camp			Annexure No. 3.21
	Quarry and stone crusher unit			Annexure No. 3.22
	Borrow area			Annexure No. 3.23
	Debris disposal site			Annexure No. 3.24
Stage-IV. Closure of sites				
Checklists for Monitoring Redevelopment of Sites / Camps	Construction camp	Nil	Monitor the implementation of redevelopment plan through site visits and checklists as and when a site is closed and reported through the register of sites.	Annexure No. 3.25
	Labour camp			Annexure No. 3.26
	Quarry and stone crusher unit			Annexure No. 3.27
	Borrow area			Annexure No. 3.28
	Debris disposal site			Annexure No. 3.29
B. For Overall Project				
Format for Register of complaints and its reporting	All project sites	Monthly	Monitor the implementation of management measures through site visits and approve the reports monthly.	Annexure No. 3.18
Reporting Format for Work Force Management	All project sites	Monthly		Annexure No. 3.30
Reporting Format for Occupational Health and Safety Measures	All project sites	Monthly		Annexure No. 3.31
Reporting Format for Water Sprinkling for Dust Suppression	All project sites	Monthly		Annexure No. 3.32
Reporting Format for Road Safety Measures During Construction	All project sites	Monthly		Annexure No. 3.33
Reporting Format for Register of	All project sites	Monthly		Annexure No. 3.34

reporting / Monitoring format	Applicable Project Site	Frequency of reporting by Contractor	Frequency of reporting / Action to be taken by CSC	Applicable annexure no.
Accidents and it's Reporting				
Reporting Format for Enhancement and Mitigation of Common Property Resources	All project sites	Monthly		Annexure No. 3.36
Reporting Format for Tree Plantation	All project sites	Monthly		Annexure No. 3.37
Reporting Format for Monthly Report from Contractor to CSC	All project sites	Monthly		Annexure No. 3.38
Reporting Format for monthly Report from CSC to PMT	All project sites	Nil	Monthly	Annexure No. 3.39
C. For Environmental Quality Monitoring				
Reporting Format for Environmental Quality Monitoring	All project sites	Monitoring is to be conducted as per Environmental Quality Monitoring plan in Table 5.2. To be submitted to CSC along with the Monthly report.	Verify the details through site visits and approve the reports monthly	Annexure No. 3.35

5.2. Environmental Monitoring Plan for the Project

The environmental monitoring plan for the project is presented in **Table 5.2.** For each of the environmental components, the monitoring plan specifies the technical aspects of monitoring like locations of monitoring; frequency of monitoring and duration, sampling method, parameters to be monitored, standards to be compared. The monitoring plan also specifies the applicable standards, and implementation and supervising responsibilities.

Table 5.2. Environmental Monitoring Plan

Technical aspect of monitoring	Details of each technical aspect
Air Quality Monitoring	
Project stage	Construction and operation stages
Parameter	PM10, PM 2.5, SO2, NOx, and CO
Sampling Method	High volume air sampler to be located 50 m from the source of pollution in the downwind direction. Method specified by CPCB for analysis shall be followed.
Standards	Revised National Ambient Air Quality (NAAQ) Standards set by CPCB
Frequency	Once in every season for three seasons (except monsoon) per year for four years (Construction phase - Three years and Defect liability period – one year).
Duration	Continuous 24 hours / or for 1 full working day
Locations along the Project Road*	Ponkunnam (Commercial area) and Pala (Residential area).
Other Locations**	One monitoring station near each construction related facility namely, hot mix plant, stone crusher and quarry area along the project road during construction stage. Monitoring shall be done at each additional hot mix plant, if present.
Measures	Wherever air pollution parameters increase above specified standards, additional measures as decided by the engineer shall be adopted.
Implementation	Contractor through NABL approved monitoring agencies
Supervision	CSC appointed by KSTP
Water quality Monitoring	
Project stage	Construction stage
Parameter	pH, BOD, COD, TDS, Pb, Oil & Grease, Detergents and Faecal Coliforms for Surface water. pH, TDS, Total hardness, Sulphate, Chloride, Fe, and Pb for groundwater.
Sampling Method	Grab sample collected from source and analysis as per Standard Methods for Examination of water and Waste water
Standards	Indian standards for Inland Surface Water (IS; 2296, 1982) and for Drinking water (IS; 10500,1991)
Frequency	Twice a year (pre monsoon and post monsoon seasons) during the entire construction period
Duration	One-time grab sampling
Locations along the Project Road*	**Surface water -–T**hree locations in the stretch from Ponkunnam to Thodupuzha, i.e., stream near Poovarani Temple, Meenachil River at Pala and Irrigation Canal near Kolani. **Ground water –** Two locations in the stretch from Ponkunnam to Thodupuzha, i.e.,well at Paika and Karimkunnam
Measures	At locations of increased water pollution towards down stream, all inflow channels shall be checked for pollution loads and channel delivering higher pollution loads shall be terminated from disposal into the water source.
Implementation	Contractor through NABL approved monitoring agencies

Technical aspect of monitoring	Details of each technical aspect
Supervision	CSC appointed by KSTP
Noise Level Monitoring	
Project stage	Construction and operation stages
Parameter	Noise level on dB (A) scale
Sampling Method	Measure equivalent noise levels using an integrated noise level meter kept at a distance of 15m from edge of the pavement
Standards	Noise Pollution (Regulation and Control) Rules, 2000
Frequency	Once in every seasons (except monsoon) for each year of construction.
Duration	Reading to be taken at 15 seconds interval for 15 minutes every hour for 24 hours and then average will be taken.
Locations along the Project road. Monitoring is to be done by CSC using noise meter from KSTP	Four locations i.e., Ponkunnam (Commercial area), Pala (Residential area), Govt. L.P. School, Karimkunnam (silent zone) and Govt. L.P. School, Kolani, Thodupuzha (silent zone)
Other Locations**	Hot mix plant, stone crusher and quarry area. Monitoring shall be done at each additional hot mix plant, if present.
Measures	In case of noise levels causing disturbance to the sensitive receptors, management measures as suggested in the EMP shall be carried out.
Implementation	In location 1 by Environmental Engineer of SC using the instruments provided by KSTP and in locations 2 by the Contractor
Supervision	Environmental Engineer in EMU

**Locations along the project stretch and cost is part of BOQ for Contractor.*

*** Locations mentioned here includes quarry, stone crusher site and construction camp. This activity is part of Contractor's responsibility and related cost. Hence it is not covered under BOQ.*

Chapter 6. Environmental Budget

6.1. Environmental Budget to be Incurred by KSTP

Environmental budget as detailed in **Table 6.1** the cost of training to be imparted to staff of KSTP, cost of monitoring as per the monitoring plan in **Table 5.2,** vehicle purchase cost, mangrove afforestation cost and cost of oxbow land development. An amount of Rs 3,35,88,000 has been considered for KSTP II as environmental budget to be incurred by KSTP, which include,

A. Environmental Training Cost. This includes environmental training for PMT staff and project level environmental training in Kerala at an expense of Rs. 6,00,000.

B. Vehicle, travel and administrative costs. This includes cost of vehicle to be purchased and other travel and administrative costs. It is budgeted as Rs. 21,88,000.

C. Noise monitoring & dissemination of information cost. Monitoring of noise at locations along the project stretch as listed in **Table 5.2** vests upon CSC using the noise monitoring machine of KSTP. Based on this an amount of Rs. 8,000,00 has been budgeted under this head. Dissemination of information to public is also included in this item.

D. Oxbow land development. It has been proposed by KSTP that type A and type B oxbow lands shall be developed in consultation with other government agencies by selecting activities which will be socially and economically feasible for its location and surroundings. A total amount of Rs. 3,00,00,000 has been budgeted for this.

Table 6.1. Environmental Budget to be Incurred by KSTP

Items	Unit	Quantity	Unit Rate (Rs)	Amount (Rs)
A. Environmental Training				
Environmental training for PWD/PMT Staff and Modules preparation	Number	5	100000	5,00,000
Project level Environmental Training In Kerala	Number	2	50000	1,00,000
Subtotal				**6,00,000**
B. Travel and Administrative Costs for EMU				
Travel and Administrative Costs	Month	36	18000	6,48,000
Vehicle	Number	1	10,00,000	10,00,000
Maintenance of vehicle	Month	36	15,000	5,40,000
Subtotal				**21,88,000**
C. Monitoring Equipments & Dissemination of Information				
Monitoring of Noise level	Number	30	10,000	3,00,000
Dissemination of Information to Public	Lump sum	-	-	5,00,000
Subtotal				**8,00,000**
D. Oxbow Land Development				
Development of type A and B oxbow land	Each	10	30,00,000	3,00,00,000
Subtotal				**3,00,00,000**
Grand Total				**3,35,88,000**

6.2. Contractor Items Requiring Environmental Management

The **Table 6.2** provides details of environmental mitigation measures undertaken for the project like tree planting and shrub planting along oxbow lands, for noise barriers, providing bus shelters, hand pumps etc.

Table 6.2. Contract Items Included in Contractor Cost for Environmental Management (Contract BOQ Bill No 11) for Link 84

Description	Unit	Estimate Quantity
Demolishing the existing compound wall of public building and clearing debris to a designated location as approved by Engineer and constructing or raising Sound Insulating stone walls for silence zones as mentioned in table titled "EMAP" in the EMP.	cum	2791
Providing hand pumps including provision made in RAP and as mentioned in table titled "EMAP" in the EMP.	No.	6
Constructing bus shelter for all bus laybys as detailed in the design drawing and as mentioned in table titled "EMAP" in the EMP.	Nos	41
Providing sign boards indicating major rivers, tourist location, pilgrim centres and silent zones as mentioned in table titled "EMAP" in the EMP.	Sqm	30
Preserving and landscaping the cultural properties like shrines and hyundi as mentioned in table titled "EMAP" in the EMP.	Nos	7
Demolishing the existing open well and reconstructing the same as mentioned in table titled "EMAP" in the EMP.	Nos	3
Dismantling the existing water taps and providing new water taps as mentioned in table titled "EMAP" in the EMP.	Nos	33
Developing parking space for the land acquired for auto rickshaws, cars and jeep as identified in the strip plan and as mentioned in table titled "EMAP" in the EMP.	sqm	7,520
Providing landscaping with provision of solid waste collection (dust bin), sitting arrangement as per typical design drawings provided in EMP	Nos	15
Planting of trees by the road side (avenue trees) in 0.60 m dia holes, 1 m deep dug in the ground, mixing the soil with decayed farm yard/sludge manure, planting the saplings, backfilling the trench, watering, fixing the tree guard and maintaining the plants for one year as mentioned in table titled "EMAP" in the EMP.	Nos	864
Planting of trees on inner side of the sound insulating wall as noise barrier or green barrier for silence zones and maintaining them for one year as mentioned in table titled "EMAP" in the EMP.	Nos	440
Providing and maintaining water sprayer in order to water the construction surface to suppress excessive dust in dry season in addition to watering for compaction as mentioned in table titled "EMAP" in the EMP.	Hour	1,800
Air quality monitoring at five sensitive locations along the project road for three years (including defect liability period) by an NABL accredited Lab as mentioned in table titled "EMAP" in the EMP.	Nos	18
Water Quality Monitoring at eleven major water bodies along the road during construction stage as mentioned in table titled "EMAP" in the EMP.	Nos	30
Concrete flooring with slope drains and oil interceptors for hot mix plant area and work shop, vehicle washing and fuel handling area in construction camps as mentioned in table titled "EMAP" in the EMP.	Nos	3

Construction related environmental management/mitigation related items are included in Contractor cost are tabulated in the project contract BOQ bill no 2 titled “Site Clearance” and

bill no 3 titled "Earth work". These are tabulated **Table 6.3** (Bill No 2) and **Table 6.4** (Bill no 3) respectively. Construction related environmental mitigation items have been defined as the following and have been tabulated to account for the additional costs incurred for the measures specified. In several instances, these costs are negligible; the mitigation actions are part of good engineering practice and project management.

Table 6.3. Contract Items Requiring Environmental Management Included in Contractor Cost for Site Clearance (Contract BOQ Bill No 2) for Link 84

Description	Unit	Estimated Quantity
Removal of Stumps & Roots of trees above 300mm-600mm girth	No.	183
Removal of Stumps & Roots of trees above 600mm-900mm girth	No.	122
Removal of Stumps & Roots of trees above 900mm-1800mm girth.	No.	87
Removal of Stumps & Roots of trees above 1800mm girth.	No.	47
Dismantling Brick/Stone masonry structures including disposal of resulting material and salvaging useful materials, complete	cum	648
Same as item no. 202-01, but for Plain cement concrete, complete	cum	17
Same as item no. 202-01, but for RCC, complete	cum	226
Same as item no. 202-01, but for Steel structures, complete	tonne	1

Table 6.4. Contract Items Requiring Environmental Management Included in Contractor Cost for Earth Work (Contract BOQ Bill No 3) for Link 84

Description	Unit	Estimated Quantity
Roadway excavation in ordinary soil, (as per 301.2.1 (c) & (d) of MORT&H specifications), including haul and tip to all leads, complete and as directed by the Engineer.	cum	152,020
Roadway excavation in Hard rock, including blasting and haul and tip to all leads & lifts, complete or as directed by the Engineer	cum	42,902
Earth work in excavation for drain, including haul to tip, complete and as directed by the Engineer	cum	102,108
Loosening and re-compacting subgrade in all kinds of soil, complete and as directed by the Engineer	cum	43,939
Earthwork in Excavation of foundation for structures, in ordinary soil, including haul and tip to all leads, complete and as directed by the Engineer	cum	104,656
Construction of embankment and shoulder with approved material from excavation of roadway, drains, culverts and other structures complete and as directed by the Engineer	cum	84,360
Earthwork in fill for footpath and service duct, complete and as directed by the Engineer	cum	3,129
Construction of subgrade with approved materials from excavation of roadway, drain, culverts and structures, complete and as directed by the Engineer	cum	52,988
Backfill behind drains, abutment, wing walls, return walls for bridges, culverts and retaining wall and for piers, complete and as directed by the Engineer	cum	16,758
Turfing side slope of roads and islands at major junctions with grass sods, complete and as directed by the Engineer	sqm	12,593
Seeding and Mulching, complete and as directed by the Engineer	sqm	500

Annexures

List of Annexures

Annexure 3. 1. Guidelines for Siting, Management and Redevelopment of Construction Camps

A. OVERVIEW

Construction camp accommodates a mix of activities, which are highly polluting in nature causing considerable environmental impact and its proper siting, management and redevelopment is crucial to avoid, minimize and mitigate those impacts. The EMAP clearly distinguishes between various impacts that may occur at various stages of the camp like (i) siting, (ii) setting up, (iii) operation and (iv) closure / redevelopment and provide respective mitigation measures to some extent. In addition to that, this guideline has been prepared to provide the Contractor with comprehensive and systematic information on various steps to be undertaken during these four stages, so that s/he can execute his/her role in an environmentally sound manner. Various mitigation measures have been synthesized into this guideline so that it serves as a single and stand alone document for the Contractor .

B. CRITERIA FOR SITING THE CAMP

To the extent, possible barren land or wastelands shall be preferred during site selection and fertile land and agricultural land shall be avoided. All such sites must be above the HFL with adequate drainage facility. In areas prone to floods, cyclones, cloudbursts or heavy rainfall, selection of the site should be made keeping in mind the safety of the camp and the workers. In addition, the Contractor should take care of the following criteria for locating the site:

- A minimum of 250 m away from any major settlement or village in downwind direction.
- A minimum of 200 m of any major surface water course or body[1]
- Not within 500 m from ecologically sensitive areas like wild life sanctuary, mangroves etc.
- Sufficiently wide access roads (at least 5.5 m Wide) for heavy vehicle movements

After identification of the site the Contractor should fill up the prescribed reporting format and submit the same for approval to the CSC without which any activity shouldn't be started on the site

C. FINALIZATION OF SELECTED SITE/S

After identification of the site, the Contractor should fill up the prescribed reporting format provided in EMAP and submit the same for approval to the CSC. Environmental Officer of CSC shall approve the selected site/s, after considering the compliance with the EMP clauses. No agreements or payments shall be made to the land owner/s prior to receipt of a written approval from the CSC. Any consequence of rejection prior to the approval shall be the responsibility of the Contractor and shall be made good at his own cost. After obtaining a written approval from the CSC for the selected site, the Contractor has to enter into an agreement with the landowner to obtain his/her consent before commencing any operation / activities in the land. The agreement should also mention its type, duration, amount and mode of payment as well as the preferences of the owner regarding site maintenance and redevelopment.

[1] In the absence of site meeting the stipulated criteria, an alternate site can be selected specifying the reasons. In such a case, the construction camp management plan should incorporate additional measures specific to the site as suggested by the CSC.

D. DESIGNING OF CAMP / PREPARATION OF LAYOUT PLAN

The Contractor should design a layout plan of the camp with adequate space for (i) site office along with store room, rest area and sanitary facilities, (ii) plants, machineries, (iii) workshops, (iv) vehicle washing area, (v) fuel handling area, (vi) room for raw material unloading and stocking, (vii) space for storage and handling of solid wastes (viii) security cabin etc. The laying out of these should be undertaken in such a manner that it facilitates smooth functioning of both man and machine. Fuel pumps, storage facility for inflammable and hazardous chemicals/ materials shall be provided inside the camp, but at a safe distance from office. Electric safety practices shall be integrated/ incorporated during the lay-out plan preparation.

Prevailing wind direction shall be kept in mind while planning out the lay-out of internal facilities. Cutting of trees should be minimum and the existing ones need to be integrated into the lay-out plan with proper planning. The roads within the camp should be well planned with adequate space for movement of vehicles and their parking.

E. SETTING UP OF CONSTRUCTION CAMP

(i) Site preparation: The stripping, stacking and preservation of top soil will be mandatory in case of farm lands and fertile areas and absolutely no material stacking or equipment installment or vehicle parking or any other activity should be allowed prior to the satisfactory completion of this activity as per guidelines in EMP. Thereafter, the site should be graded and rendered free from depressions such that the water does not get stagnant anywhere. A compound wall of 2.4 m height should be constructed all around the camp to prevent the trespassing of humans and animals. Green belt should be provided along the boundary and as detailed in the EMP, it should be integrated with storm water drain and sedimentation trenches as given in annexure in EMAP. No. of trees planted should not be less than three times the number of trees cut. The approved layout plan should be strictly adhered to while setting up the camp.

(ii) Setting up of plants and machineries: Adequate arrangements should be made for avoiding fugitive emissions from plants and camp premises. This will include (i) control of air pollution through provision of in-built dust extraction systems like bag filter, damper and cyclone filter for bitumen hot mix plant, (ii) a chimney of appropriate height (as per SPCB guideline) from ground level attached with dust extraction system and scrubber for the hot mix plant, (iii) a chimney of appropriate height for the DG set (iv) water sprinkling facilities for the concrete batching plant, wet mix macadam plant as well as in the camp premises and (v) garden net to prevent fugitive emissions from storage place of cement and aggregates.. It has to be also ensured that effluent from the sludge tank of the scrubber is recycled and reused and the sludge is used for land filling with top soil spread on it.

To ensure that noise levels are within the limit, all plants and machineries should have their own silencers or any other noise control devices. All pollution control devices should be provided with back up power. Following conditions should be complied regarding the sound level conditions:

- The sound level (Leq) measured at a distance of 1 m from the boundary of the site shall not exceed 55dB (A) during day time (6am - 6pm) and 45 dB(A) during night time (6 pm - 6am).
- The total sound power level of the DG set shall be less than 96+10 log 10(KVA) dB(A) where KVA is the nominal power rating of DG set.

- The DG set shall be provided with acoustic enclosure/acoustic treatment with an insertion loss of minimum 25 dB(A).
- The DG set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB(A).
- A proper, routine and preventive maintenance procedure for the DG set shall be set and followed in consultation with the DG set manufacturer.
- Concrete flooring with slope drains and oil interceptors should be proposed for hot mix plant area and workshop, vehicle washing and fuel handling area as per EMP, so that oil and lubricants that may spill on the floor does not contaminate any soil or water body. In case of any oil spills, it should be cleaned properly. There shall also be provisions for storage of used oil until it is disposed as per comprehensive waste management plan prepared by Contractor and approved by CSC.

(iii) Sanitation Facilities: Adequate no. of toilets shall be provided separately for males and females (depending on their strength), screened from those of men and provided with markings in vernacular language. All such facilities must have adequate water supply with proper drainage and effluent treatment system like septic tank with soak pit. Soak pit should have a sealed bottom, honey comb wall and 75 cm. thick, 2 mm sand envelope around that. The sewage system for the camp must be properly sited, designed, built and operated so that no health hazard occurs and no pollution to the air, ground or adjacent watercourses takes place.

Portable toilets may be brought to use and the night soil from such units has to be disposed through designated septic tanks so as to prevent pollution of the surrounding areas. In the construction camp, no night soil or sewerage shall be disposed of at any place other than the septic tanks constructed at the site.

(iv) Waste Disposal: While preparing the layout plan, the Contractor should allocate adequate space for storage and handling of various wastes generated until they are disposed off in pre-identified disposal sites. The Contractor should provide separate garbage bins for biodegradable, non-biodegradable and domestic hazardous wastes in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner. No incineration or burning of wastes shall be carried out by the Contractor . The disposal of any biodegradable matter shall be carried out in pits covered with a layer of earth within the camp site. Discarded plastic bags, paper and paper products, bottles, packaging material, gunny bags, hessian, metal containers, strips and scraps of metal, PVC pipe scrubber and poly urethane foam, auto mobile spares, tubes, tires, belts, filters, waste oil, drums and other such materials shall be either reused or sold /given out for recycling. POL (petroleum, oil and lubricants) waste shall be disposed off by transfer only to recycler/ re-refiners possessing valid authorization from the State Pollution Control Board and valid registration from the Central Pollution Control Board. Used lead batteries, if any, should be disposed as per the Batteries (Management and Handling) Rules 2001.

(v) First aid / safety facilities: At every camp site, a readily available first-aid unit including an adequate supply of sterilized dressing materials and appliances should be provided. Workplaces which are remote and far away from regular hospitals should have indoor health units with one bed for every 250 workers. Details of nearest clinics as well as major hospitals like their location, distance from camp, phone nos. facilities offered by the hospital should be displayed in the camp office at clearly visible location in a legible manner. Suitable transport should be provided to facilitate taking injured and ill

persons to the nearest hospital. Adequate personal protective equipments and fire fighting equipments as detailed out in EMP should be made available in the camp and provided to the staff / workers. Operation manuals and training should be provided to machine operators. Warning signs should be placed at accident prone areas as well as at the entrance of the site.

(vi) Training to workers: Workers shall be trained in smooth operation of plants and machines, their regular maintenance and various safety measures to be followed as well as about the need for adherence to these measures.

(vii) Information dissemination: There should be a sign board of size 6' x 4' mentioning the project details and Contractor 's details to disseminate the information to the public. There should be a second sign board displaying the latest air and noise monitoring data against the standards specified.

Warning signboards should be set up at the entrance gate for the public as well as at other required places for the workers to alert them about the nature of operation being undertaken at those respective places.

Once the construction camp is set up, the date of commissioning of the camp should be intimated to the Head Office and concerned District Office of the SPCB.

F. OPERATION OF CONSTRUCTION CAMP

During the operation phase of the camp it is important to ensure that all vehicles and machineries are maintained regularly and their PUC certificates are renewed at regular intervals. All pollution control devices should be monitored and maintained properly at regular intervals. In case of process disturbance/ failure of pollution control equipments, the respective units should be shut down and should not be restarted until the control measures are rectified to achieve the desired efficiency. All units should operate only between 6 am and 10 pm. or as specified by SPCB in the consent letter.

Oil and grease waste generated from garages in construction camps should be drained out through oil interceptors and they should be maintained properly. Necessary arrangements should be made for regular sprinkling of water for dust suppression. Raw materials and products should be transported with proper cover to prevent spreading of dust.

Hygienic environment must be ensured by (i) provision of safe drinking water, (ii) proper maintenance of toilets including daily cleaning and disinfection using proper disinfectants, (iii) regular cleaning of drains by removing the silt and solid waste, (if any) and iv) appropriate waste management practices. While it is of utmost importance to ensure that fire fighting equipments like fire extinguishers are in working condition, it should also be monitored that construction workers use the personal protective equipments provided to them and they are replaced when necessary. All these facilities should be inspected on a weekly basis to achieve the desired levels of safety and hygiene standards.

Environmental monitoring should be undertaken by the Contractor as stipulated in the EMP. If any standard is set by SPCB for hot mix plant emissions, the Contractor should collect samples of emission from all the chimneys and analyse for the parameters at least once in a month. The CTE certificate from SPCB should be renewed at regular intervals and the same should be intimated to CSC.

A register should be maintained at the site office which provides (i) a one page format for each migrant labourer which will give their personal profile (including name, age, sex, educational qualification, address, blood group and any major illness), along with a copy of any ID proof and an original

photograph, (ii) a copy of the ID card of local labourers. A copy of the details of the migrant labourers should be submitted to the local police station.

G. PREPARATION OF CONSTRUCTION CAMP MANAGEMENT AND REDEVELOPMENT PLAN

After the site for the construction camp has been finalized and approved by CSC, the Contractor should prepare a construction camp management plan to be submitted to CSC for approval prior to setting up of the camp and it should comprise the following details:

- **Section–1: Details of site:** Copy of approved site identification report along with location plan on a village map or an FMB, showing the site, its survey no., access road, project stretch, distance form the project stretch, surrounding features and land use like residences, agricultural land, water bodies etc., photograph of the site showing the topography and other existing features.
- **Section-2: Site preparation:** Activities that will be undertaken for preparing the site based on EMP and this guideline.
- **Section-3: Arrangements/ facilities within the camp:** List of plants / machineries to be set up within the camp like hot mix plant, batching plant, DG set etc., and other facilities to be provided like site office, store room, rest room, toilet room, material stocking yard etc, layout plan showing all these details along with vehicular movement path, green belt etc. Species wise no. of trees to be cut shall be provided.
- **Section-4: Mitigation measures** that will be undertaken as per the EMP and this guideline while setting up of the camp and operation of the camp should be separately listed out here.
- **Sectoin-5: Other details:** Any other relevant detail like list of trainings to be provided to workers, details of information dissemination, date of CTE certificate from SPCB, its validity, additional conditions laid down in it etc. should be included.
- **Section 6: Re-development plan**, which should indicate the following points: (i) List of structures to be demolished and list of the clean up activities that needs to be undertaken, (ii) Proposed use of the land after de-mobilising and (iii) Presence of facilities that could be put in use by the land owner if it is a leased out private land or community in case of a public property.
- **Section-7: Annexure-(a) Working drawings:** Electrical plan showing the electrical network planned for the site, location of plants, generators, master switch boards etc. and plumbing drawing showing the network of water supply lines, sewerage line and drainage line, **(b) Copy of certificates** / permissions obtained from regulatory authorities / local governing body / community etc. as applicable, **(c) Copy of agreement entered with the owner** of the site if it is a leased out land.

All the drawings should have north direction marked in it along with prevailing wind direction. Necessary dimensions and specifications should be provided where ever necessary. The construction camp management plan should be submitted to the CSC for a written approval before any physical work (includes storage of materials, equipment etc.) is undertaken on a particular site. The CSC shall carefully examine the proposals considering the specific conditions of each site as well as various EMP and regulatory provisions and provide suggestions, as necessary to the Contractor who shall incorporate it in the management plan.

Contractor needs to prepare this document for each different site identified and CSC shall undertake a thorough analysis of the said management and redevelopment plan through a site investigation and suggest additional mitigation measures depending on the site and as demanded by the features of the specific site.

H. DEMOBILIZATION AND REDEVELOPMENT OF THE SITE

The Contractor should clear all temporary structures; dispose all building debris, garbage, night soils and POL waste as per the approved debris management plan. All disposal pits or trenches should be filled in, disinfected and effectively sealed off. All the areas within the camp site should be leveled and spread over with stored top soil. Residual topsoil, if any will be distributed or spread evenly in plantation sites, on adjoining/near-by barren land or affected agricultural land adjacent to the RoW that has been impacted on account of any accidental spillage. Entire camp area should be left clean and tidy, in a manner keeping the adjacent lands neat and clear, at the Contractor 's expense, to the entire satisfaction of landowner and CSC.

These activities should be completed by the Contractor prior to demobilization. Once the Contractor finishes his job, he needs to obtain a certificate from the owner, stating that the site has been re-developed to his/her satisfaction and in tune with the agreement. Then following documents needs to be submitted to the CSC by the Contractor :

- Copy of approved site identification report
- Photographs of the concerned site 'before' and 'after' setting up the camp.
- Certificate from the owner stating his/her satisfaction about status of re-development of the site.

CSC shall ensure, through site verification that all clean-up and restoration operations are completed satisfactorily and a written approval should be given to the Contractor mentioning the same before the 'works completion' certificate is issued/recommended. The PMT shall ensure through site inspection that the Contractor and CSC have complied with all these provisions. The site can then be handed over to the concerned owner or local bodies or for local communities as the case may be.

Certification/documentation pertaining to approval for clean-up and restoration operations and thereafter handing-over to the owner shall be properly maintained by the Contractor , Supervision Consultant and PMT.

Annexure 3. 2. Guidelines for Siting, Management and Redevelopment of Labour Camps

A. OVERVIEW

Staff-quarters include accommodation for Engineers / Supervisors and labour camp include accommodation for workers / labourers along with other basic amenities such as kitchen, potable water supply, sanitation (toilets, bathrooms, washing areas and water supply for such needs), first aid room as well as garbage collection and disposal facility. Staff quarters shall be provided with additional facilities of drawing room. The guidelines outlined here aims to facilitate the Contractor in implementing the measures in the EMP there by reducing the impact on the environment.

B. CRITERIA FOR LOCATING THE SITE/S

Following criteria should be followed in the siting of labour camps:

- To the extent possible, agricultural lands and fertile lands shall be avoided[2].
- Not to be located in CRZ area.
- Not within 500m of ecologically sensitive areas like wild life, sanctuary, mangroves, forest etc.

C. FINALIZATION OF SELECTED SITE/S

After identification of the site, the Contractor should fill up the prescribed reporting format provided in EMAP and submit the same for approval to the CSC. The selected site/s shall be approved by Environmental Officer of CSC, after considering the compliance with the EMP clauses. No agreements or payments shall be made to the land owner/s prior to receipt of a written approval from the CSC. Any consequence of rejection prior to the approval shall be the responsibility of the Contractor and shall be made good at his own cost. After obtaining a written approval from the CSC for the selected site, the Contractor has to enter into an agreement with the landowner to obtain his/her consent before commencing any operation / activities in the land. The agreement should also mention its type, duration, amount and mode of payment as well as the preferences of the owner regarding site maintenance and redevelopment.

D. DESIGNING AND SETTING UP OF LABOUR CAMP

Following facilities should be provided in a labour camp to ensure safe, clean and hygienic accommodation for the workers.

(i) Site preparation: The site should be graded and rendered free from depressions such that the water does not get stagnant anywhere. Fencing should be constructed all around the camp to prevent the trespassing of humans and animals. Green belt should be provided along the boundary and as detailed in the EMP, it should be integrated with storm water drain and sedimentation trenches as given in annexure in EMAP. No. of trees planted should not be less than three times the number of trees cut. The approved layout plan should be strictly adhered to while setting up the camp.

[2] In the absence of site meeting the stipulated criteria, an alternate site can be selected specifying the reasons. In such a case, the construction camp management plan should incorporate additional measures specific to the site as suggested by the CSC.

(ii) Accommodation: Contractor will follow all relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labour camp. The height of the worker's and labour accommodation shall not be less than 3mt. from floor level to the lowest part of the roof. The camps shall be floored with concrete, shall be kept clean, with proper cross ventilation, and the space provided shall be on the basis of one sq.mt per head or as per the relevant regulation, which ever is higher. Fire and electrical safety pre-cautions shall be adhered to. Cooking, sanitation and washing areas shall be provided separately. The Contractor will maintain necessary living accommodation and ancillary facilities (including provision of clean fuel to prevent damage to forests and to prevent fuel wood cutting and burning by labour) in functional and hygienic manner.

The site must be graded and rendered free from depressions such that water does not get stagnant anywhere. The entire boundary of the site should be fenced all around with barbed wire so as to prevent the trespassing of humans and animals. Green belt should be provided along the boundary and it should be integrated with storm water drain and sedimentation trenches to reduce the surface run off as per clauses in EMAP. No. of trees planted should not be less than three times the number of trees cut.

(iii) Drinking Water: The Contractor should provide potable water within the precincts of every workplace in a cool and shaded area, which is easily accessible as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. All potable water storage facilities will be on a safely raised platform that is at least 1m above the surrounding ground level. Such facilities shall be regularly maintained from health and hygiene point of view. If necessary water purifier units shall be installed for providing potable water.

As far as possible shallow wells should not be used as potable source of water. However, if water is drawn from any existing well, irrespective of its location from any polluting sources, regular disinfection of the water source (which may include application of lime, bleaching power and potassium permanganate solution) has to be ensured at weekly/fort nightly interval. All open wells will be entirely covered and will be provided with a trap door to prevent accidental fall and contamination from dust, litter etc. The trap door will be kept locked and opened only for cleaning or inspection, which will be done at least once in a month. A reliable pump will be fitted to each covered well. A drain shall be constructed around the well to prevent flow of contaminated water into the well from road, camp or other sources. Water quality testing of all potable water sources will be done every six months as per parameters prescribed in IS 10500:1991.

(iv) Sanitation Facilities: Adequate no. of toilets shall be provided separately for males and females (depending on their strength), screened from those of men and provided with markings in vernacular language. All such facilities must have adequate water supply with proper drainage and disposal facility. They shall be maintained, cleaned and disinfected daily using proper disinfectants. Location and design of soak pit should be in such a way that it doesn't pollute the ground water. Drains and ditches should be treated with bleaching powder on a regular basis. The sewage system for the camp must be properly designed, built and operated so that no health hazard occurs and no pollution to the air, ground or adjacent watercourses takes place.

Portable toilets may be brought to use and the night soil from such units has to be disposed through designated septic tanks so as to prevent pollution of the surrounding areas. In the main camp, no night soil or sewerage shall be disposed of at any place other than the septic tanks constructed at the site. All these facilities shall be inspected on a weekly basis to check the hygiene standards.

(v) Waste Disposal: The Contractor should provide garbage bins in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner. No incineration or burning of wastes shall be carried out by the Contractor . Separate bins shall be provided for biodegradable, non-biodegradable and domestic hazardous wastes. The disposal of kitchen waste and other biodegradable matter shall be carried out in pits covered with a layer of earth within the camp site. The Contractor may use the compost from such wastes as manure in the plantation sites. Discarded plastic bags, paper and paper products, bottles, packaging material, gunny bags, hessian, metal containers, strips and scraps of metal, PVC pipe scrubber and poly urethane foam, auto mobile spares, tubes, tires, belts, filters, waste oil, drums and other such materials shall be either reused or sold /given out for recycling.

(vi) Day Crèche Facility: At every construction site, provision of a day crèche shall be made so as to enable women to leave behind their children while going to work. At least one attendant shall be provided to take care of the children at the crèche. At construction sites where 20 or more women are employed, there shall be at least one shelter for use of children under the age of 6 years belonging to such women.

Shelters shall not be constructed to a standard lower than that of thatched roof, mud walls and floor with wooden planks spread over mud floor and covered with matting. Such areas shall be safely barricaded (no sharp sheets or barbed wires that may injure a child) from rest of the camp for the safety of children. Shelters shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision to keep the place clean. The size of a crèche may vary according to the number of children on a camp site.

(vii) Mess and Kitchen Facilities: The Contractor shall adhere to the sanitary/hygiene requirements of local medical, health and municipal authorities at all times. Adopt such precautions as may be necessary to prevent soil and water pollution at the site while operating mess or kitchen facilities.

(viii) First aid facilities: At every workplace, a readily available first-aid unit including an adequate supply of sterilized dressing materials and appliances should be provided. Workplaces remote and far away from regular hospitals should have indoor health units with one bed for every 250 workers. Suitable transport should be provided to facilitate taking injured and ill persons to the nearest hospital. Adequate personal protective equipments and fire fighting equipments as detailed out in EMP should be made available in the camp and provided to the staff / workers.

(ix) Health Care Facilities: Health problems of the workers should be taken care of by providing basic health care facilities. If there is no hospital or clinic, which can be accessed in half an hour's time, then a temporary health center should be set up for the construction camp. The health centre should have at least a doctor and a nurse, duty staff, medicines and minimum medical facilities to tackle first aid requirements or minor accidental cases, linkage with nearest higher order hospital to refer patients of major illnesses or critical cases.

The health centre should have MCW (Mother and Child Welfare) units for treating mothers and children in the camp. Apart from this, the health centre should be provided with regular vaccinations required for children. The health centre should carryout quarterly awareness programme of HIV – AIDS with the help of AIDS control society as well as about community living and hygiene practices in day to day living. Posters should be exhibited in the health care clinic.

E. OPERATION OF LABOUR CAMP

Through out the functioning period of the camp, hygienic environment must be ensured by (i) provision of safe drinking water, (ii) proper maintenance of toilets including daily cleaning and disinfection using proper disinfectants, (iii) regular cleaning of drains by removing the silt and solid waste, (if any) and iv) appropriate waste management practices. While it is of utmost importance to ensure that fire-fighting equipments like fire extinguishers are in working condition, it should also be monitored that construction workers use the personal protective equipments provided to them and they are replaced when necessary. All these facilities should be inspected on a weekly basis to achieve the desired levels of safety and hygiene standards.

F. PREPARATION OF LABOUR CAMP MANAGEMENT AND RE-DEVELOPMENT PLAN

After the site for the labour camp has been finalized and approved by CSC, the Contractor should prepare a labour camp management and redevelopment plan to be submitted to CSC for approval prior to setting up of the camp and it should comprise the following details:

- **Section–1: Details of site:** Copy of approved site identification report along with location plan on a village map or an FMB, showing the site, its survey no., access road, project stretch, distance form the project stretch, surrounding features and land use like residences, agricultural land, water bodies etc., photograph of the site showing the topography and other existing features.
- **Section-2: Site preparation:** Activities that should be undertaken for preparing the site based on EMP and this guideline.
- **Section-3: Arrangements/ facilities within the camp:** List of facilities to be provided along with its details like area, no of people to be accommodated and a layout plan showing the plan of the site with all the facilities planned like quarters, labour camps, mess, common facilities, toilet facilities and the vehicular and pedestrian movement paths.
- **Section-4: Mitigation measures** that should be undertaken as per the EMP and this guideline while setting up of the camp and operation of the camp should be separately listed out here.
- **Sectoin-5: Other details:** Any other relevant detail like list of awareness camps to be provided to workers, details of information dissemination etc. should be included.
- **Section 6: Re-development plan**: which should indicate following points: (i) List of structures to be demolished and list of the clean up activities that needs to be undertaken, (ii) Proposed use of the land in the post construction phase, if it is a public property, (iii) Presence of existing facilities that could be put in use by the land owner if it is a leased out private land or by the community in case of a public property.
- **Section-7: Annexure-(a) Working drawings:** Electrical plan showing the electrical network planned for the site, location of generators, master switch boards etc. and plumbing drawing showing the network of water supply lines, water tank, drainage facilities etc. **(**b) Copy of permissions obtained from local governing body / community etc. as applicable, (c) Copy of agreement entered with site owner, in case of leased out sites.

All the drawings should have north direction marked in it along with prevailing wind direction. Necessary dimensions and specifications should be provided where ever necessary. The labour camp management plan should be submitted to the CSC for a written approval before any physical work is

undertaken on a particular site. The CSC will carefully examine the proposals in light of the various EMP and regulatory provisions and provide suggestions, as necessary to the Contractor who shall incorporate it in the management plan. Contractor shall be responsible for satisfactory and timely completion of these EMP requirements.

Contractor needs to prepare this document for each different site identified and CSC shall undertake a thorough analysis of the said management and redevelopment plan through a site investigation and suggest additional mitigation measures depending on the site and as demanded by the features of the specific site.

G. RE DEVELOPMENT OF THE LABOUR CAMP

The Contractor should clear all temporary structures; dispose all building debris, garbage, night soils and any other waste as per the approved debris management plan. All disposal pits or trenches should be filled in, disinfected and effectively sealed off. Residual topsoil, if any will be distributed or spread evenly in plantation sites, on adjoining/near-by barren land or affected agricultural land adjacent to the RoW that has been impacted on account of any accidental spillage. Entire camp area should be left clean and tidy, in a manner keeping the adjacent lands neat and clear, at the Contractor 's expense, to the entire satisfaction of landowner and the CSC.

These activities should be completed by the Contractor prior to demobilization. Once the Contractor finishes his job, he needs to obtain a certificate from the owner, stating that the site has been re-developed to his/her satisfaction and in tune with the agreement. Then following documents needs to be submitted to the CSC by the Contractor :

- Copy of approved site identification report
- Photographs of the concerned site 'before' and 'after' setting up the camp.
- Certificate from the owner stating his/her satisfaction about status of re-development of the site.

CSC shall ensure, through site verification that all clean-up and restoration operations are completed satisfactorily and a written approval should be given to the Contractor mentioning the same before the 'works completion' certificate is issued/recommended. The PMT shall ensure through site inspection that the Contractor and CSC have complied with all these provisions. The site can then be handed over to the concerned owner or local bodies or for local communities as the case may be.

Certification/documentation pertaining to approval for clean-up and restoration operations and thereafter handing-over to the owner shall be properly maintained by the Contractor , Supervision Consultant and PMT.

Annexure 3. 3. Guidelines for Siting, Management and Redevelopment of Quarrying and Stone Crushing Operations

A. OVERVIEW

A quarry is a type of open-pit mine from which rock or minerals are extracted for building materials, such as dimension stone, construction aggregate, riprap, sand, and gravel. Quarrying causes lot of environmental damages like air and noise pollution, water logging etc. and requires permission from regulatory authorities like mining department. It requires a careful approach in the site selection process, scientific method of quarrying and appropriate measures to redevelop it.

B. CRITERIA FOR LOCATING THE SITE/S

The selection of a quarry is sole responsibility of the Contractor and should be undertaken in adherence to the rules & regulations of the authorities. Following criteria should be followed while selecting a quarry site:

- To the extent possible barren land or waste lands shall be preferred during site selection and fertile land and agricultural land shall be avoided.
- There shall be no quarrying of sand in any river bed or adjoining area or any other area which is located within 500 meters radial distance from the location of any bridge, water supply system, infiltration well or pumping installation of any of the local bodies or Central or State Government Department or any area identified for locating water supply schemes by any of the Government Department or other bodies.
- Quarry site shall be located at a minimum distance of: 500 m from any human settlements, public road, railway line, national highway, state highway or major district road.
- Stone quarry shall be located at a minimum distance of 50 m from any water body.
- Locate the quarry and crusher at a min. distance of 500 m. away from forests / wildlife habitats / mangroves / ecologically sensitive areas.
- The minimum distance between two stone crushers should be 1 km to avoid dust pollution influence of one over the other.
- Stone crushing unit should be distanced for 500 m from the NH or SH or residential area or places of public and religious interests.
- Access roads to quarry sites must be wide enough for heavy vehicle movement without inconvenience to local traffic.

After identification of the site, Contractor should fill up the prescribed reporting format and submit the same for approval to the CSC without which any activity shouldn't be started on the site.

C. FINALIZATION OF SELECTED SITE/S

After identification of the site, the Contractor should fill up the prescribed reporting format provided in EMAP and submit the same for approval to the CSC. The selected site/s shall be approved by Environmental Officer of CSC, after considering the compliance with the EMP clauses. No agreements or payments shall be made to the land owner/s (in case of a leased or rented out land) prior to receipt of a written approval from the CSC. Any consequence of rejection prior to the approval shall be the

responsibility of the Contractor and shall be made good at his own cost. After obtaining a written approval from the CSC for the selected site, the Contractor has to enter into an agreement with the land owner to obtain his/her consent before commencing any operation / activities in the land. The agreement should also mention its type, duration, amount and mode of payment as well as the preferences of the owner regarding site maintenance and redevelopment.

D. SETTING UP OF QUARRYING AND STONE CRUSHER

Quarrying involves not only extraction of material (rock) but also crushing and screening that makes the rock suitable for use as construction material. Following are the major parameters to be considered before the start of quarrying and stone crushing operations:

(i) Site preparation: The stripping, stacking and preservation of top soil will be mandatory and absolutely no activity should be allowed prior to the satisfactory completion of this conservation measure as per guidelines in EMAP. The boundary of the quarry should be demarcated using barbed wire fencing in order to avoid the future dispute over land as well as to avoid accidental trespassing of people. There should be recorded documents of exact no of trees cut. Green belt should be provided all along the quarry site to function as both noise attenuators and dust collectors and number of trees planted should not be less than three times the number of trees cut. Contour trenches should be dug along the borrow area boundary and at any other appropriate places considering the topography to reduce the surface run off and conserve soil and water. Side slopes shall be constructed with slope drains at applicable locations, to provide drainage and avoid any land slides. All the drainage constructed should be linked to existing drainages in order to avoid flooding and water logging.

(ii) Setting up of a quarry site: The layout of a quarry should provide a gravity flow of material from the face to the crusher, from the crusher to the storage bin and from the bin to the hauling equipment. Adequate arrangements should be made for avoiding fugitive emissions from quarry and crusher premises. This will include (i) housing the noise and dust producing units of the crusher unit in a building with wall of minimum 23 cm thickness and with suitable roofing, (ii) control of air pollution through provision of in-built dust extraction systems in the crusher unit and all transfer points, (iii) a chimney of appropriate height for the DG set (as specified by SPCB), (iv) water sprinkling facilities for the camp premises, (v) facilities to store water required for 3 days use.

Consent to operate the crusher unit should be obtained from SPCB under Air (Prevention and Control of Pollution) Act, 1981 before starting the operation.

(iii) Safety aspects: Blasting timings in quarry should be fixed avoiding the rush hours and these timings should be adhered to in order to avoid the conflict between the surrounding communities or population. Provide warning sirens 10 before each explosion as a warning alarm to people in and outside the quarry. Damaged explosives must be disposed off in a safe manner away from the operational area. Speed of the vehicles around the quarry should be restricted to a low speed in order to reduce the noise pollution and dust generation. Workers should not be exposed to sound of more than 85 – 90 DB for more than eight hours a day and shall be provided with adequate safety wears and personal protective equipments like ear muffs / plugs etc as detailed out in EMP. Fire extinguishers should be provided in the site office.

Traffic movements should be restricted along the access road around times that children walk to and from school. Proper first aid facilities should be provided within the site office and in case of an accident, quick access to nearby hospital /clinic should be provided.

(iv) Facilities for workers: Potable drinking water should be provided in the site office in a hygienic environment sufficient for all the people. Adequate no. of toilets shall be provided for the workers with adequate water supply, proper drainage and effluent treatment system like septic tank with soak pit. Soak pit should have a sealed bottom, honey comb wall and 75 cm. thick, 2mm sand envelope around that. The sewage system for the camp must be properly sited, designed, built and operated so that no health hazard occurs and no pollution to the air, ground or adjacent watercourses takes place.

(v) Waste Disposal: The Contractor should provide separate garbage bins for biodegradable, non-biodegradable and hazardous wastes in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner. No incineration or burning of wastes shall be carried out by the Contractor . The disposal of any biodegradable matter shall be carried out in pits covered with a layer of earth within the camp site. Discarded plastic bags, paper and paper products, bottles, packaging material, gunny bags, hessian, metal containers, strips and scraps of metal, PVC pipe scrubber and poly urethane foam, auto mobile spares, tubes, tires, belts, filters, waste oil, drums and other such materials shall be either reused or sold /given out for recycling. POL (petroleum, oil and lubricants) waste shall be disposed off by transfer only to recycler/ re-refiners possessing valid authorization from the State Pollution Control Board and valid registration from the Central Pollution Control Board. Used lead batteries, if any, should be disposed as per the Batteries (Management and Handling) Rules 2001.

Quarry areas should be protected from illegal dumping of waste by third parties. The overburden should be kept as minimum to maximize the commercial efficiency of the quarry, it can be utilized for creating earth bunds to mitigate the noise and visual impacts and also for the site rehabilitation process. No quarry waste shall be dumped within a 100 m on either side of the road. The overburden should be reused or disposed properly. Site for overburden disposal should be planned within the quarry site or any other appropriate site.

(vi) Training to workers: Workers shall be trained in smooth and safe operation of plants and equipments, their regular maintenance and various safety measures to be followed as well as about the need and importance for adherence to these measures. All the drivers should be trained about safe driving and should be made aware about the need to observe caution while plying through access roads, especially during the time when children walk to and from school. Conduct education programs with the locals regarding the potential impacts of blasting, blasting warning systems, schedules etc.

(vii) Information dissemination: There should be a sign board of size 6' x 4' mentioning the project details and Contractor 's details to disseminate the information to the public. There should be a second sign board displaying the latest air and noise monitoring date and data against the standards specified. Warning sign boards should be set up at the entrance gate for the public as well as at other required places for the workers to alert them about the nature of operation being undertaken.

Other mitigation measures: The quarry should not damage any building, work, property or rights of other persons. The quarry should not alter any right of way, well or tank. Roads inside the crusher premises should be tarred or concreted. Water course, if any, from a higher slope should be properly drained out. Strom water drainage shall be provided to prevent water logging and flooding in and around the area. The possibility of collecting the storm water in a pit or a tank should be explored so that it can be reused for dust suppression and the dependence on other water sources could be reduced. If this is not possible, the water should be safely channeled out of the quarry without disturbing any nearby human settlement. A register should be provided in the camp site for public to record their grievances if any. Environmental monitoring should be conducted as per suggested frequency.

The concerned authority – CSC/ PIU should regularly review the environmental, health and safety aspects. If any adverse effect on environment, habitat and concern of safety is noticed, appropriate measures should be taken as suggested by CSC or should arrange an alternative for road construction materials. In the case of existing quarries and additional quarries, the Contractor has to ensure that all actions in these quarries are in compliance with EMP.

E. OPERATION OF QUARRY SITE AND STONE CRUSHING UNIT

No quarrying operation shall be done without the approval from the concerned authority. The equipment used in quarry should be wear faced, which extends the equipment life and reduce the demand for spare parts. Adopt controlled blasting techniques and conduct quarrying in a skillful, scientific and systematic manner. All units should operate only between 6 am and 10 pm. or as specified by SPCB in the consent letter.

Accessory facilities to be provided in the quarry includes sprinklers to spray water for dousing the dust generation, noise suppressers and rubberized mounting to reduce noise and vibration and tarpaulins or covers over material transporting vehicles. Provide sufficient water storage facility for 2 days' use. Measures have to be taken to reduce the dust generation during drilling operation. Deep wetting of drilling zones also to be done by water sprinkling and drilling machine shall be fitted with dust suppression, collection and disposal arrangements. In case of blasting, the storage and the operation should be as per the regulations. To avoid spillage of fuel and lubricants, the vehicles and equipment should be properly maintained and repaired. Maintenance should be carried out on impervious platforms with spill collection provisions.

Following conditions regarding sound generation should be complied with in a quarry / crusher unit:

- The sound level (Leq) measured at a distance of 1 m from the boundary of the site shall not exceed 55 dB(A) during day time (6am - 6pm) and 45 dB(A) during night time (6 pm - 6am).
- The DG set shall be provided with exhaust muffler /acoustic enclosure/acoustic treatment with an insertion loss of minimum 25 dB(A) and its emission levels should be within relevant SPCB guidelines.
- A proper, routine and preventive maintenance procedure for the DG set shall be set and followed in consultation with the DG set manufacturer.

F. PREPARATION OF QUARRY MANAGEMENT AND REDEVELOPMENT PLAN

The Contractor after getting approval from the competitive authority for the selected site should submit a detailed Quarry Management Plan comprising the following details:

- **Section–1: Details of site:** Copy of approved site identification report along with location plan on a village map or an FMB, showing the site, its survey no., access road, project stretch, distance form the project stretch, surrounding features and land use like residences, agricultural land, water bodies etc., photograph of the site showing the topography and other existing features.
- **Section-2: Site preparation:** Activities that should be undertaken for preparing the site based on EMP and this guideline.
- **Section-3: Arrangements/ facilities within the camp:** List of facilities to be set up within the site like site office, store room, rest room, sanitation facilities etc. and a layout plan showing all

these details along with vehicular movement path, green belt, locations were digging of contour trenches should be undertaken etc.

- **Section-4: Mitigation measures** that will be undertaken as per the EMP and this guideline while setting up of the camp and operation of the camp should be separately listed out.
- **Sectoin-5: Other details:** Any other relevant detail like list of awareness camps to be provided to workers, details of information dissemination etc. date of quarry licence obtained from Dept of Mines, its validity, additional conditions laid down in it etc. should be included in the quarry management plan. Species wise no. of trees to be cut and the details of top soil to be removed and conserved like quantity, location of storing etc. shall also be provided.
- **Section 6: Re-development plan**: which should indicate following points: (i) List of structures to be demolished and list of the clean up activities that needs to be undertaken, (ii) Proposed use of the land in the post construction phase, if it is a public property, (iii) Presence of existing facilities that could be put in use by the land owner if it is a leased out private land or by the community in case of a public property.
- **Section-7: Annexure-(a) Working drawings:** Electrical plan showing the electrical network planned for the site, location of generators, master switch boards etc. **(b) Copy of** permissions obtained from local governing body / community etc. as applicable, **(c) Copy of agreement entered with site owner**, in case of leased out sites.

All the drawings should have north direction marked in it along with prevailing wind direction. Necessary dimensions and specifications should be provided where ever necessary. The quarry and crusher unit management plan should be submitted to the CSC for a written approval before any physical work (includes storage of materials, equipment etc.) is undertaken on a particular site. The CSC will carefully examine the proposals in light of the various EMP and regulatory provisions and provide suggestions, as necessary to the Contractor who will implement it within the stipulated time period.

Contractor needs to prepare this document for each different site identified and CSC shall undertake a thorough analysis of the said management and redevelopment plan through a site investigation and suggest additional mitigation measures depending on the site and as demanded by the features of the specific site.

G. REDEVELOPMENT OF QUARRY AREA

The main objective of the redevelopment of quarries is to make the area a safe and secure place and adapt it to a suitable land use like leisure place or fishing place etc. which is suitable for the physical environment as well as for the community around. Along with the preparation of quarry and crusher management plan the Contractor should also prepare a re-development plan, which will be submitted for approval to CSC who in turn will be responsible for approving and monitoring these plans. The redevelopment plan should indicate following points:

- List of structures to be demolished and list of the clean up activities that needs to be undertaken.
- Presence of existing facilities that could be put in use by the land owner if it is a leased out private land or community in case of a public property.
- The proposed use of the quarry site with a layout plan showing the proposed facilities / improvement measures, list of local plant species that could be planted etc.

- Photographs of the site before, during and after the quarrying process.

Possible re-development options include the following:

- Re-vegetation of the quarry to merge with surrounding landscape with reuse of top soil mixed together with farm yard manure.
- Development of exhausted quarries as water bodies, where the quarry pit is developed into pond or a rainwater harvesting structure.
- Pits created as a result of blasting could be filled with over burden which are removed and stockpiled in other areas or with construction debris. Top soil should be spread back and trees should be planted along the boundary.

Tree plantation where ever possible depending on the proposed use, erosion control measures etc should be taken up as part of the redevelopment plan.

The Contractor should clear all temporary structures; dispose all debris, garbage, night soils and any other waste as per the approved debris management plan. All disposal pits or trenches should be filled in, disinfected and effectively sealed off. Residual topsoil, if any will be distributed or spread evenly in plantation sites, on adjoining/near-by barren land or affected agricultural land adjacent to the RoW that has been impacted on account of any accidental spillage. Entire camp area should be left clean and tidy, in a manner keeping the adjacent lands neat and clear, at the Contractor 's expense, to the entire satisfaction of land owner and the CSC.

These activities should be completed by the Contractor prior to demobilization. Once the Contractor finishes his job, he needs to obtain a certificate from the owner, stating that the site has been re-developed to his/her satisfaction and in tune with the agreement. Then following documents needs to be submitted to the CSC by the Contractor :

- Copy of approved site identification report
- Photographs of the concerned site 'before' and 'after' setting up the camp.
- Certificate from the owner stating his/her satisfaction about status of re-development of the site, this is applicable only in the case of a site to be returned to the owner.

CSC shall ensure, through site verification that all clean-up and restoration operations are completed satisfactorily and a written approval should be given to the Contractor mentioning the same before the 'works completion' certificate is issued/recommended. The PMT shall ensure through site inspection that the Contractor and CSC have complied with all these provisions. The site can then be handed over to the concerned owner or local bodies or for local communities as the case may be.

Certification/documentation pertaining to approval for clean-up and restoration operations and thereafter handing-over to the owner shall be properly maintained by the Contractor , Supervision Consultant and PMT.

Annexure 3. 4. Guidelines for Siting, Management and Redevelopment of Borrow Areas

A. BORROW AREA SELECTION

A borrow describes an area where material (usually soil or sand) has been dug for use at another location, for example, soil might be excavated to fill an embankment for a highway. In some cases, the borrow pits may become filled with ground water posing a danger to the surrounding community. If properly redeveloped, it can be turned into recreational areas or sustainable wildlife habitats. In other cases, borrow pits may be used for landfill and waste disposal also.

B. CRITERIA FOR SITE SELECTION

The Contractor in addition to the established practices, rules and regulation shall also use the following criteria before finalizing the locations of borrow areas:

- The borrow area should not be located in agriculture areas especially in paddy fields unless unavoidable i.e. barren land is not available. In case borrowing needs to be done on an agricultural land, top-soil stripping, stacking and preservation is a must.
- Borrow pits shall not be located within a distance of 100 mts. from any NH, SH or other roads.
- Site shall be located 30m away from toe of the embankment along road side.
- Site should be located not less than 30m from the toe of the bank along the river side or irrigation tank bund.
- Borrow area shall be located at a minimum distance of 30m from the toe of the irrigation tank bund.
- Borrow site shall be located at a minimum distance of 500 m in down-wind direction of villages and settlements.
- No borrow pits shall be located within 250 m. from schools, colleges, playgrounds, religious structures and health centers.
- No borrow area shall be opened within 500 m. from a reserved or protected forest area/sites, wildlife movement zone and cultural heritage site.
- Loss of vegetation shall be almost nil or minimum.
- Borrow area near any surface water body will be at least 100mts. away from the toe of the bank or high flood level, whichever is maximum. After identification of borrow area location/s, the Contractor will fill the prescribed reporting format and submit the same for approval to the "Site Engineer" at least 7 working days before commencement of earth works. A written approval from CSC shall be necessary before any activity/work is commenced.
- Borrow pit location shall be located at least 0.8 km from villages and settlements. If unavoidable, they should not be dug for more than 30 cm and should be drained.

C. Finalization of the selected area

After identification of the site, the Contractor should fill up the prescribed reporting format provided in EMAP and submit the same for approval to the CSC. The selected site/s shall be approved by

Environmental Officer of CSC, after considering the compliance with the EMP clauses. No agreements or payments shall be made to the land owner/s (in case of a leased or rented out land) prior to receipt of a written approval from the CSC. Any consequence of rejection prior to the approval shall be the responsibility of the Contractor and shall be made good at his own cost. After obtaining a written approval from the CSC for the selected site, the Contractor has to enter into an agreement with the land owner to obtain his/her consent before commencing any operation / activities in the land. The agreement should also mention its type, duration, amount and mode of payment as well as the preferences of the owner regarding site maintenance and redevelopment.

D. BORROW AREA MANAGEMENT

- Before the start of operations, the area to be borrowed shall be marked by the Contractor with wooden or stone pegs to ensure that the land required for slope stabilization or bund creation is maintained. Supervision Consultant has to ensure that this marking is done on the ground to avoid issues at a later date. Any disregard of this condition shall be made good at the Contractor 's and/or consultant's own expense.
- After receiving the approval, the Contractor will begin operations keeping in mind the following points.
- Top soil conservation is to be undertaken only if its reuse is envisaged for the proposed activity in the borrow area rehabilitation. Top soil that cannot be re-used in rehabilitation of borrow areas shall be used in the plantation belt/zone along the road.
- Damage to productive and fertile areas has to be minimum. This includes appropriate planning of haul roads.
- No excavated acceptable material other than surplus to requirements of the Contract shall be removed from the site. Contractor should be permitted to remove acceptable material form the site to suit his operational procedure, and then be shall make good any consequent deficit of material arising there from.
- Where the excavation reveals a combination of acceptable and un-acceptable materials, the Contractor shall, unless otherwise agreed by the Engineer, carryout the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the un-acceptable materials. The acceptable material shall be stockpiled separately.
- The Contractor shall ensure that he does not adversely affect the stability of excavation or fills by the methods of stockpiling materials, use of plants or siting of temporary buildings or structures.
- The following principles shall be adhered to during borrow area operations:
- A 15 cm topsoil layer will be stripped off from the borrow pit and this will be preserved in stockpiles in a designated area with a height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
- Borrowing of earth will be allowed up to a depth of 1.5 mtr from the existing ground level only.

- Ridges of not less than 8m width will be left at intervals not exceeding 300m.Small drains will be cut through the ridges, if necessary, to facilitate drainage.
- The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal).
- Rehabilitation shall be satisfactorily undertaken immediately after the use has ceased and at least three weeks prior to monsoon.
- If the rehabilitation plan envisages re-use of top soil, then preserved top soil has to be spread uniformly over the land used as a borrow area.
- Bunds and temporary fencing (using barbed wire) along with plantation should be provided in case the borrow area is developed as a pond to ensure safety of the residents and the cattle. However, the depth shall not exceed 1.5 m.

E. Preparation of Borrow Area Management and Redevelopment Plan

The Contractor after getting approval from the competitive authority for the selected site should submit a detailed Borrow Area Management and Redevelopment Plan comprising the following details:

- **Section–1: Details of site:** Copy of approved site identification report along with location plan on a village map or an FMB, showing the site, its survey no., access road, project stretch, distance form the project stretch, surrounding features and land use like residences, agricultural land, water bodies etc., photograph of the site showing the topography and other existing features.
- **Section-2: Site preparation:** Activities that should be undertaken for preparing the site based on EMP and this guideline.
- **Section-3: Layout plan:** A layout plan showing all these details along with vehicular movement path, green belt, locations were digging of contour trenches should be undertaken etc.
- **Section-4: Mitigation measures** that will be undertaken as per the EMP and this guideline while setting up of the camp and operation of the camp should be separately listed out.
- **Sectoin-5: Other details:** Any other relevant detail like list of awareness camps to be provided to workers, details of information dissemination etc. date of quarry licence obtained from Dept of Mines, its validity, additional conditions laid down in it etc. should be included in the quarry management plan. Species wise no. of trees to be cut and the details of top soil to be removed and conserved like quantity, location of storing etc. shall also be provided.
- **Section 6: Re-development plan**: which should indicate following points: (i)proposed use of the land in the post construction phase, (ii) preferences of land owner with respect to redevelopment, (iii) Presence of existing facilities that could be put in use by the land owner if it is a leased out private land or by the community in case of a public property, (iv) Extent of community involvement.
- **Section-7: Annexure-(a) Copy of** permissions obtained from local governing body / community etc. as applicable, **(b) Copy of agreement entered with site owner**, in case of leased out sites.

All the drawings should have north direction marked in it along with prevailing wind direction. Necessary dimensions and specifications should be provided where ever necessary. The management

plan should be submitted to the CSC for a written approval before any physical work (includes storage of materials, equipment etc.) is undertaken on a particular site. The CSC will carefully examine the proposals in light of the various EMP and regulatory provisions and provide suggestions, as necessary to the Contractor who will implement it within the stipulated time period.

Contractor needs to prepare this document for each different site identified and CSC shall undertake a thorough analysis of the said management and redevelopment plan through a site investigation and suggest additional mitigation measures as demanded by the features of the specific site and its surroundings.

F. REHABILITATION OR RE-DEVELOPMENT OF BORROW AREAS

The objective of the borrow area rehabilitation is to return the borrowing sites to a safe and environmentally sound condition. The concept entails enhancing benefits (including those linked to livelihood) for the community and individuals. Top soil preservation (and its re-use) and proper stabilization of slopes are the fundamental requirements of the rehabilitation process. Re-development plan shall be prepared and submitted along with reporting format by the Contractor before the borrowing operation is permitted by the CSC. The redevelopment is to be prepared in consultation with land owner/s (whether public, private or institutional) and by within the environmental and safety requirements of the EMP. Some key points on borrow area rehabilitation are presented in the table provided below. However, the Contractor is free to prepare other rehabilitation scheme/s subject to the approval by the Environmental Officer of the Supervision Consultant

Type/Form Of Rehabilitation	**Reuse of Top Soil**	**Actions Required For Rehabilitation**
Farm land	Yes	Leveling Slope Stabilization along the edges if there is a level difference
Ponds including creation of new ones and enhancing capacity of existing ones (for irrigation; pissiculture and general uses by people and/or cattle)	No	Slope Stabilization (angle/benching) Access / Approach Ramp Bund creation and Temporary Fencing Plantation in the periphery
Water recharging areas/percolation tanks (depth up to one meter)	No	Slope Stabilization Small bund creation
Leveled lands that can be developed later for various uses (such as residential areas, parking lots, community grounds etc.)	Generally No	Leveling Top soil re-use depends on the type of developmental work envisaged
Construction waste disposal sites (for non-toxic/non-hazardous wastes) (reinstated with top-soil with plantation over the rehabilitated site)	No	Depression after filling-in of wastes to be leveled-up Top soil re-use depends on the type of developmental work envisaged
Plantation Zones	Yes	Leveling Selection of Species as per OSRP Project Guidelines
Water holes for animals and birds (outside forest and protected areas)	No	Gentle Slopes on all sides Plantation in the periphery Depth upto 1.5 m.

Rehabilitation works shall be undertaken immediately upon the exhaustion of the approved quantity and shall not be delayed. The Supervision Consultant shall take appropriate action in case delays are observed.

These activities should be completed by the Contractor prior to demobilization. Once the Contractor finishes his job, he needs to obtain a certificate from the owner, stating that the site has been re-developed to his/her satisfaction and in tune with the agreement. Then following documents needs to be submitted to the CSC by the Contractor :

- Copy of approved site identification report
- Photographs of the concerned site 'before' and 'after' setting up the camp.
- Certificate from the owner stating his/her satisfaction about status of re-development of the site.

CSC shall ensure, through site verification that all clean-up and restoration operations are completed satisfactorily and a written approval should be given to the Contractor mentioning the same before the 'works completion' certificate is issued/recommended. The PMT shall ensure through site inspection that the Contractor and CSC have complied with all these provisions. The site can then be handed over to the concerned owner or local bodies or for local communities as the case may be.

Certification/documentation pertaining to approval for clean-up and restoration operations and thereafter handing-over to the owner shall be properly maintained by the Contractor , Supervision Consultant and PMT.

Annexure 3. 5. Guidelines for Siting and Management of Debris Disposal Site

A. OVERVIEW

Construction of highways generates huge quantity of building debris, which needs to be disposed off in previously identified sites suitable for such an activity. This process entails close scrutiny of the sites with respect to their location and this section details out the criteria to be followed in doing so. Moreover, it also guides the Contractor as to how to prepare the site without causing much impact on the surrounding environment.

B. CRITERIA FOR LOCATING THE SITE/S

The locations of waste disposal have to be selected such that:

- The said site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, top-soil stripping, stacking and preservation should be undertaken prior to initiation of any activities.
- Debris disposal site shall be at least 200 m away from surface water bodies[3].
- No residential areas shall be located within 100 m downwind side of the site.
- The site is minimum 250 m. away from sensitive locations like settlements, ponds/lakes or other water bodies, wetlands, protected areas, forests, wildlife habitats / Mangroves / Ecologically sensitive areas, seasonal streams, rivers, canals, flood plains, educational institutions, medical centers, religious sites, cultural or heritage sites and play grounds.
- The local governing body and community shall be consulted while selecting the site.
- The selected site shall meet with the local regulatory requirements (including those of SPCB, Municipalities etc.).
- The site shall preferably be owned by government so that there is no need to acquire the land for the same.

After identification of the site the Contractor should fill up the prescribed reporting format and submit the same for approval to the CSC. Any activity on the site can be initiated only after obtaining permission form the CSC.

C. FINALIZATION OF SELECTED SITE/S

The selected site/s shall be approved by CSC and PMT, after considering compliance with the EMP clauses and this guideline. No agreements or payments shall be made to the land owner/s prior to

[3] In the absence of site meeting the stipulated criteria, an alternate site can be selected specifying the reasons. In such a case, the construction camp management plan should incorporate additional measures specific to the site as suggested by the CSC.

receipt of a written approval from the CSC and PMT. Any consequence of rejection prior to the approval shall be the responsibility of the Contractor and shall be made good at his own cost.

D SETTING UP OF DEBRIS DISPOSAL SITE

Following steps has to be undertaken while setting up a debris disposal site:

- Top soil conservation has to be undertaken as per the guidelines given in EMP.
- Considering the topography of the site contour trenches as detailed in EMP should be made along the site boundary to prevent soil erosion.
- Fencing should be provided for the debris disposal site to prevent trespassing of humans and animals into the area as well as to prevent spread of the waste material through action of wind, water, scavengers or rag pickers.
- No of trees cut should be recorded and three times the same should be planted as green belt development or elsewhere as part of the project.
- Provide proper drainage facility so that the run off from the site doesn't contaminate any near by water sources or rivers.

E PREPARATION OF DEBRIS DISPOSAL SITE MANAGEMENT AND REDEVELOPMENT PLAN

The Contractor after getting approval from the competitive authority for the selected site should submit a detailed Debris Disposal Site Management and Redevelopment Plan comprising the following details:

- **Section–1: Details of site:** Copy of approved site identification report along with location plan on a village map or an FMB, showing the site, its survey no., access road, project stretch, distance form the project stretch, surrounding features and land use like residences, agricultural land, water bodies etc., photograph of the site showing the topography and other existing features.
- **Section-2: Site preparation:** Activities that should be undertaken for preparing the site based on EMP and this guideline.
- **Section-3: Arrangements within the site:** A layout plan showing the existing trees, green belt, locations were contour trenches should be dug etc.
- **Section-4: Mitigation measures** that will be undertaken as per the EMP while preparing the site and dumping the waste should be separately listed out.
- **Sectoin-5: Other details:** Any other relevant details like copy of approvals / clearances obtained, species wise no. of trees to be cut and the details of top soil to be removed and conserved like quantity, location of storing etc. shall also be provided.
- **Section 6: Re-development plan**: which should indicate following points: (i) species wise no of tree to be planted, (ii) Proposed use of the land in the post construction phase, if it is a public property, (iii) Presence of existing facilities that could be put in use by the land owner if it is a leased out private land or by the community in case of a public property and (iv) Other site specific mitigation measures to be undertaken as recommended by the CSC.

- **Section-7: Annexure-(a) Copy of** permissions obtained from local governing body / community etc. as applicable, **(c) Copy of agreement entered with site owner**, in case of leased out sites.

All the drawings should have north direction marked in it along with prevailing wind direction. Necessary dimensions and specifications should be provided where ever necessary. The debris site management plan should be submitted to the CSC for a written approval before any physical work is undertaken. The CSC will carefully examine the proposals in light of the various EMP and regulatory provisions and provide suggestions, as necessary to the Contractor who will implement it within the stipulated time period.

Contractor needs to prepare this document for each different site identified and CSC shall undertake a thorough analysis of the said management and redevelopment plan through a site investigation and suggest additional mitigation measures as demanded by the features of the specific site and its surroundings.

F. REDEVELOPMENT OF WASTE DISPOSAL SITES

Along with the format seeking permission/approval for the disposal site/location from the Engineer/Supervision Consultant, the Contractor shall also submit a rehabilitation plan for the area. Following points have to be kept in view while undertaking the rehabilitation measure:

- The dump sites shall be suitably rehabilitated by planting local species of shrubs and other plants. The species (region specific) shall be chosen from the list suggested in the EA/EMP. Local species of trees should be selected so that the landscape is coherent and is in harmony with the surrounding environment.
- Rehabilitation can also include conversion into farm land, playground, parking area, block plantation area etc.
- Some of the dumpsites could be used either for plantation or for growing agricultural products such as ginger, turmeric or oranges etc.
- Care should always be taken to maintain the hydrological flow in the area.

Annexure 3. 6. Guidelines for Preparing Comprehensive Waste Management Plan

A. OVERVIEW

A comprehensive waste management plan shall be prepared by the Contractor prior to initiation of any works. The purpose of the plan is to provide standardized procedures for the clearance, removal and disposal of debris caused by major debris / waste generated during the construction work as well as to establish the most efficient and cost effective methods to resolve debris disposal issues.

B. PREPARATION OF COMPREHENSIVE WASTE MANAGEMENT PLAN

The Contractor should prepare a Comprehensive Waste Management Plan to be submitted to CSC for approval prior to setting up of construction and labour camp and it should comprise the following details:

- Categorization of waste into degradable, biodegradable and hazardous categories and list of different types of waste that falls in each of these categories.
- Estimates about the quantity of waste generated in each category and type of storage units required.
- Detail the provisions for storage and handling of waste until disposed. A plan of the respective camps / areas like construction camp, labour camp etc. to be attached indicating in it the space allocated for storage and handling of wastes.
- Detail the precautions to be taken while storing, handling and disposing each type of waste, trainings to be imparted to workers to create awareness about waste management.
- Details of each debris disposal site: Copy of approved site identification report along with location plan on a village map or an FMB, showing the debris disposal sites, site, its survey no., access road, project stretch, distance form the project stretch, surrounding features and land use like residences, agricultural land, water bodies etc., photograph of the site showing the topography and other existing features.

C. TRAINING FOR PROJECT STAFF AND WORKERS

All staff and workers involved in the highway construction should be imparted training about comprehensive waste management plan including the need for such a plan, its components and measures adopted by the Contractor for implementing it. In addition, all personnel involved should be made aware about various steps and measures each of them has to follow so as to ensure the compliance to the comprehensive waste management plan.

D. PRECAUTIONS TO BE ADOPTED DURING DISPOSAL OF DEBRIS/WASTE MATERIAL

The Contractor shall take the following precautions during transportation and disposal of debris/waste material:

- A register should be kept for recording the details of the waste generated and their disposal.
- The pre-designated disposal sites should be a part of Comprehensive Solid Waste Management Plan and should be identified as per the EMP clauses prior to initiation of any work on a particular section of the road.

- The Contractor will take full care to ensure that public or private properties are not damaged/ affected during the site clearance for disposal of debris and the traffic is not interrupted.
- All arrangements for transportation during dismantling and clearing debris, considered incidental to the work, will be implemented by the Contractor in a planned manner as approved and directed by the CSC.
- In the event of any accidental spill or spread of wastes onto adjacent parcels of land, the Contractor will immediately remove all such waste material/s and restore the affected area to its original state to the satisfaction of CSC.
- Contractor should ensure that any spoils/materials unsuitable for embankment fill shall not be disposed off near any water course; water body; agricultural land; natural habitats like grass lands, wet lands, flood plains, forests etc. pasture; eroded slopes; and in ditches, which may pollute the surrounding including water sources.
- Contractor should ensure effective water sprinkling during the handling and transportation of materials where dust is likely to be created.
- Materials having the potential to produce dust will not be loaded beyond the side and tail board level and will be covered with a tarpaulin in good condition.
- Any diversion required for traffic during disposal of debris shall be provided with traffic control signals and barriers after discussion with the local body and as approved by CSC.
- During the debris disposal, Contractor will take care of surrounding features and avoid any damage to trees and properties.
- Surplus fly ash, bottom ash and lime, if any, transported for use on this corridor shall not be left open and dumped at any disposal site. Contractor shall take care of such residual materials for use at any other location/s of new embankment construction wok with proper protection measures
- No hazardous and contagious waste material shall be disposed at such locations.

E. WASTE DISPOSAL IN CONSTRUCTION CAMP

- Concrete flooring and oil interceptors should be provided for hot mix plant area, workshops, vehicle washing and fuel handling area.
- POL (petroleum, oil and lubricants) waste shall be stored safely in separate containers and should be disposed off by transfer only to recycler/ re-refiners possessing valid authorization from the State Pollution Control Board and valid registration from the Central Pollution Control Board.
- Used lead batteries, if any, should be disposed as per the Batteries (Management and Handling) Rules 2001.
- Water separated and collected from oil interceptor should be reused for dust suppression.
- There should be a register to record the details of the oil wastes generated at the workshops and oil storage areas.

- The Contractor will provide separate garbage bins in the camps and ensure that these are regularly emptied and disposed off in safe and scientific manner as per the Comprehensive Solid Waste Management Plans approved by the CSC.
- No incineration or burning of wastes shall be carried out.
- Discarded plastic bags, paper and paper products, bottles, packaging material, gunny bags, hessian, metal containers, strips and scraps of metal, PVC pipes, rubber and poly urethane foam, auto mobile spares, tubes, tires, belts, filters, waste oil, drums and other such materials shall be either reused or will be sold /given out for recycling.
- Septic tank must be provided for toilets and the sludge should be cleared by municipal exhausters.

F. WASTE DISPOSAL IN LABOUR CAMP

- The Contractor should provide separate garbage bins in the camps for bio-degradable, non-degradable and domestic hazardous waste and ensure that these are regularly emptied and disposed off in safe and scientific manner.
- The disposal of kitchen waste and other biodegradable matter shall be carried out in pits covered with a layer of earth within the camp site to avoid smell and pests. The Contractor may use the compost from such wastes as manure in the plantation sites.
- Noon-biodegradable waste like discarded plastic bags, paper and paper products, bottles, packaging material, gunny bags, hessian, metal containers, strips and scraps of metal, PVC pipes, rubber and poly urethane foam, auto mobile spares, tubes, tires, belts, filters, waste oil, drums and other such materials shall be either reused or should be sold /given out for recycling.
- No incineration or burning of wastes should be carried out.
- Effluent treatment system like septic tank with soak pits provided for toilets should be sited, designed, built and operated in such a way that no health hazard occurs and no pollution to the air, ground or adjacent watercourses takes place.
- Soak pits must be provided to collect waste water from bathrooms and kitchen.

G. DISPOSAL OF BITUMINOUS WASTE

- The bituminous waste should be used for development of roads inside the construction camps, haul roads or for filling pot holes in rural roads.
- At locations identified for disposal of residual bituminous wastes, the disposal will be carried out over a 60 mm thick layer of rammed clay so as to eliminate the possibility of leaching of wastes into the ground water.
- The Contractor will suitably dispose off unutilized non-toxic debris either through filling up of borrows areas located in wasteland or at pre-designated disposal sites, subject to the approval of CSC.

- Debris generated from pile driving or other construction activities along the rivers and streams drainage channels shall be carefully disposed in such a manner that it does not flow into the surface water bodies or form puddles in the area.

H. DISPOSAL OF NON BITUMINOUS WASTE

- Non-bituminous wastes other than fly ash may be dumped in borrow pits (preferably located in barren lands) where such borrow pits are not suitable to be re-developed as an economic source like pisci-culture or a source of irrigation. Such borrow pits can be filled up with non-bitumen wastes and then covered with a minimum 30cm layer of the soil, where plantation of trees and shrubs will be taken-up by the Contractor as a part of site rehabilitation.
- Local tree species suitable for such re-habitation work shall be selected in consultation with local community.

I. REUSE OF DEBRIS GENERATED FROM DISMANTLING STRUCTURES AND ROAD SURFACE

Debris generated due to the dismantling of existing road will be suitably reused in the proposed construction as follows

- Eighty percent (80%) of the sub-grade excavated from the existing road surface, excluding the scarified layer of bitumen, shall be reused in the civil works after improving the soil below the subgrade through addition of sand and suitable cementing material for qualitative up-gradation.
- The dismantled scraps of bitumen will be utilized for the paving of cross roads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes, parking areas along the corridor or in any other manner approved by the Environmental Officer of CSC.

Annexure 3. 7. Guidelines for Top Soil Conservation and Reuse

The top soil from all sites including road side widening and working area, cutting areas, quarry sites, construction camps, labour camps, haul roads in agricultural fields (if any) and areas to be permanently covered shall be stripped to a specified depth of 15 cm and stored in stock piles for reuse. A portion of temporarily acquired area and/or RoW edges will be earmarked for storing top soil. The locations for stacking will be pre-identified in consultation and with approval of environmental officer of CSC. The following precautionary measures will be taken by the Contractor to preserve the stock piles till they are re-used:

Stockpiles will be such that the slope doesn't exceed 1:2 (vertical to horizontal), and height is restricted to 2 m.

- To retain soil and allow percolation of water, the edges of pile will be protected by silt fencing.
- Multiple handling kept to a minimum to ensure that no compaction occurs.
- Such stockpiles shall be covered with empty gunny bags or will be planted with grasses to prevent the loss during rains.

Such stockpiled topsoil will be utilized for:

- Covering reclamation sites or other disturbed areas including quarry areas.
- Top dressing and raising turfs in embankment slopes
- Filling up of tree pits
- For developing compensatory afforestation plantation
- In the agricultural fields of farmers, acquired temporarily that needs to be restored.

Residual top soil, if there is any, shall be utilized for the plantations works along the road corridor. The utilization as far as possible shall be in the same area from where top soil was removed. The stripping, preservation and reuse shall be carefully inspected, closely supervised and properly recorded by the CSC.

Annexure 3. 8. Guidelines for Provision of Noise Barriers

Mitigating the impact of increased noise levels at the sensitive receptor locations includes posting of signs prohibiting the use of horns, constructing a sound insulating wall and, to the extent possible, planting appropriate trees to serve as green noise barriers. Attenuation of sound can be achieved considerably by the combined effect of sound insulating walls and green barriers. Nevertheless the putting of green barriers requires at least 2-5m additional space between the solid barrier and the receptor. Principle of the designed barrier is explained in the design sections. Proposed project mitigation actions are cost effective when compared to the generally recommended expensive double glazed windows.

A. SOUND INSULATING WALLS FOR SILENCE ZONES

The design of a sound insulating wall comprises 23 cms. thick brick wall which will act as a sound barrier. The typical cross section for the same is given in Figure 1. This can be provided adjacent to the road corridor where hospitals, medical centre, schools and other educational institutions are affected by the traffic noise.

B. GREEN BARRIERS FOR SILENCE ZONES

These are simply a thick layer of green plantation with limited foliage (eg. Ashoka Tree) acting as noise absorbers. These trees may be planted just inside and adjacent to the wall. While Contractors will be responsible for the implementation of the civil work, tree plantation will be carried out by the Forest department under the tree-planting scheme of the project. The implementation aspects are provided in the EMP. In addition to the noise mitigation, the thick green layer will act as an air quality filter for traffic emission. A typical green barrier of 100m lengths will have 200 trees in 4 rows.

Noise mitigation techniques will be employed as may be warranted at each of the sensitive receptor sites. Definitive noise levels will be empirically determined at each site and selection of the mitigation technique will be made on a site- specific basis in consultation with property owners. Co-ordination and implementation will be the responsibility of the Environmental officer of the Construction Supervision Consultant (CSC). Mitigation cost has been estimated as a part of the environmental costs of the project.

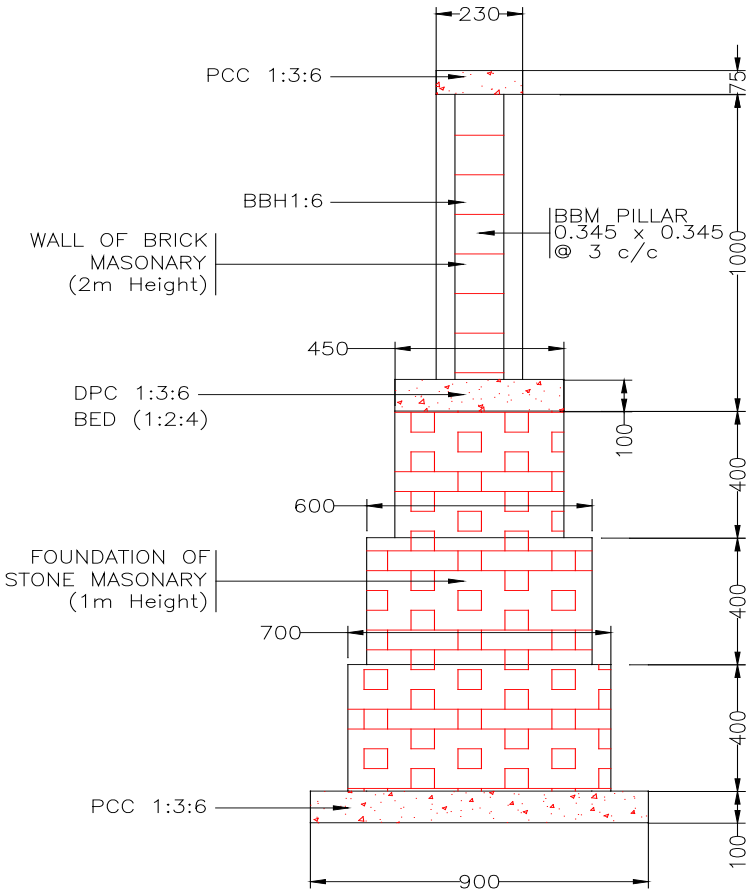


Figure 1. Typical Cross Section of a Noise Barrier

Annexure 3. 9. Guidelines to Ensure Worker's Safety During Construction

In order to ensure worker's safety while undertaking various operations / stages of construction many safety measures needs to be followed, which are listed down below:

A. TREE FELLING

- Use hard hats during tree felling
- Ensure safe use and storage of tools such as axes, power chain saw, hand saw of different types, HDPE ropes of approved thickness to drag felled trees and logs.
- Keep the saw blades in proper lubrication and sharpened state for efficient workability.
- Determine proper foot and body position when using the implements for felling, cutting and dragging.
- Wear appropriate foot protection
- Avoid cutting branches overhead.
- Keep first aid kits ready at the site.
- Determine possible hazards in the area, e.g. electrical or telephone or other utility lines, buildings, vehicles and domestic cattle that may create unsafe work situations.
- Prior to felling, determine the safest direction of fall and orient fixing of ropes and
- Cutting positions accordingly.
- Determine the proper hinge size before directing the fall.
- Keep machineries and workers ready for speedy removal of the tree from the main traffic movement area.
- Keep flag men and warning signal signage at either end of felling area to control movement of traffic and warn passers-by.
- Use loud noise signals for warning by-standers and workmen about the impending fall, so as they move away from the direction of fall.

B. PLANT SITES, CONSTRUCTION CAMP AND QUARRY AREAS

- Install perimeter fencing.
- Ensure good visibility and safe access at site entrances.
- Provide adequate warning signs at the entrance and exit, as necessary.
- Provide adequate space/area for loading and unloading, storage of materials, plant and machinery.
- Display emergency procedure and statutory notices at conspicuous locations.
- Provide areas for collecting garbage and other waste material, and also arrange for their regular/periodic disposal.

- Arrange appropriate storage, transportation and use of fuel, other flammable materials and explosives in line with the license requirements obtained from concerned authorities.
- Provide defined access roads and movement areas within the site.
- Ensure availability of first aid facilities and display notices at various work places showing the location of first aid facilities and emergency contact numbers. Provide and enforce use of PPE at plant and quarry sites.

C. HOUSE KEEPING PRACTICES

- Provide proper slope in kitchen, canteens, washrooms, toilets and bathrooms for easy and immediate draining of water.
- Keep all walkways and circulation areas clear and unobstructed at all times.
- Ensure that spillages of oil and grease are avoided and in case of accidental spills, these are immediately collected.
- Use metal bins for collection of oily and greasy rags.
- Stack raw materials and finished products out of walkways.
- Do not leave tools on the floor or in any location where they can be easily dislodged.
- Keep windows and light fittings clean.
- Maintain the workplace floors dry and in a non-slippery condition
- Provide and maintain proper drainage system to prevent water logging and unhygienic conditions.
- Ensure that protruding nails in boards or walls are moved or bent over or removed so that they do not constitute a hazard to people.
- Store all flammable materials in appropriate bins, racks or cabinets with proper cover and labels – as required for various products.
- Make sure that hazardous/dangerous chemicals are kept in the goods stores with the appropriate labeling, display of the material-safety-data-sheet (MSDS) and other precautionary measures.
- Display 'no smoking' signs in areas with high risks of fire, (eg. near fuelling areas, diesel/oils/lubricant/paint storage area, hessians, rubber, wood and plastic etc.) in and around working area.

D. TRAFFIC SAFETY AND ROADS WORKS

- Delineate advance warning zones, transition zones and construction zones at both ends of a work front. Use devices such as regulatory signs, delineators, barricades, cones, pavement markings, lanterns and traffic control lights, reflectors and signal men in appropriate manner round the clock.

- No work front should be 'touched' without putting appropriate safety measures in place. CSC will be responsible to ensure that the permission for any activity is not given without the required safety plan and practices in place.
- Put signage at appropriate locations as per the road construction activity plan to warn the road users, construction vehicles/equipment operators, pedestrians and local residents about the work in progress, speed controls, hindrances/ blockages, diversions, depressions etc. in lines with contract requirements and IRC guidelines.
- Express a regret signage for the inconvenience caused and alert about the dangers ahead on account of construction activity.
- Signage has to be: (i) simple, easy-to-understand and should convey only one message at a time; (ii) has florescent and reflective properties of the paints; iii) broad, prominent and with appropriate size of letters and figures; (iv) placed at the appropriate 'point/s' as specified in the IRC guidelines to allow proper stoppage/reaction time to approaching vehicles.
- Different sign boards shall have a mix of pictorial signs and messages in local language, Hindi and English.
- While using barricades, ensure that traffic is kept away from work areas and the road user is guided to the safe, alternative movement track.
- Ensure that excavation sites are provided with effective barriers and reflecting signage to prevent any accidental approach by vehicles during the day or night.
- Prevent entry of cattle and wildlife through proper fencing/barricading around the excavation sites.
- Provide proper uniform (light reflecting garments) to flagmen engaged in traffic control at diversions so that they can be singled out from the moving traffic.
- Provide wide red and green flags or red and green lights to flagmen for controlling traffic.
- In high traffic zones and congested areas, use of wireless communication devices with protective headgear and shoes by flagmen has to be ensured to prevent confusion and minimize the risk of accidents.

E. SAFETY DURING EXCAVATION

- The risk of accidents involving people and vehicles remains high in excavated sites. All pits or excavations shall to be barricaded to warn the road users and residents and to avoid any unauthorized entry of persons, children, domestic cattle or wildlife. For deep excavations and culvert construction sites, painted GI sheets, delineators, lamps (as required) and retro-reflective signage shall be used.
- For excavation in soft loose & slushy soil (above 2.00 m depth where sliding of earth or collapsing of sides may occur)
- Excavation more than 1.5 m. is to be done in steps of minimum 500 mm offsets with plank and stuttering support, as required under contract clauses.

- For excavation in slippery or water logged area (labour or machinery may slip or get caught in slush)
- Try to dewater the area and spread minimum 150 mm thick sand layer to avoid slipping.
- For excavation in rock where chiseling is involved (and hammer or stone pieces may fall and injure the hand, eyes or legs).
- Only experienced and skilled labour should be employed. Chisel should be held with a tight fitting grip. Goggles and leg cover should be provided to protect the labour.
- Excavation in rock where blasting is involved (risk of injury to workers and passer-by)
- Blasting is to be carried out where absolutely necessary following all explosive handling regulations with mines safety principles including use of hooters, signage, protective gear, safety fuse, detonators, ignition coils and wires, exploder dynamo etc. The danger zone has to be vacated at least 20 minutes before the actual firing. Sufficient warning through positioning of red flags, dander signs, painted drums and sirens for safety of men at work and for any passer-by is to be provided. After a lapse of minimum 15 minutes when a clear signal is given by the site-in-charge through use of whistle or horn or light, the blasting charge should be ignited. After blasting a minimum of 30 minutes gap is to be given for the rocks and earth or blocks of loose boulders to fall of so that safety and security of the staff at the operation zone is ensured. Heavy charges shall not be used in fragile rock systems, where rock disintegrating machinery could be brought to use.
- The entire operation shall be conducted under the strict supervision of qualified staff and in the presence of safety officers.
- For excavation for drain or manhole (risk of a passer-by falling into the excavated portion).
- The area should be properly barricaded with sign boards and illumination/lamps for night time safety. In congested stretches, watchmen/guards can also be placed for vigil.
- Snake bites or Scorpion Stings during excavation
- In areas with vegetation, tall grasses and forest cover, the Contractor shall provide the labour with gum boots and gloves. He shall also make snake antidotes available on site. Emergency ve`hicles should also be kept ready to rush the patient to the nearest hospital.

F. SAFETY DURING SOME TYPICAL CONSTRUCTION WORK

Centering and scaffolding (risk of framework collapse while construction, concreting or just before concreting especially when wooden ballies are used).

Many a times ballies joined together give away due to weak joints. Use of metal scaffolding and centering plates with metal fasteners are the safest and highly recommended materials for use in all road construction works for ensuring safety, stability and casting of structures. All such scaffolding should be placed on a firm and a level base on the ground for ensuring stability. No wooden scaffolding or bamboo scaffolding is to be used for any casting of heavy (RCC) structural construction as the risk to safety of workers is higher.

Railings are to be provided along working platforms and ladders for better safety. Nets shall be hung below the scaffolding or structures where work is on-going to prevent fall of debris, stones, bricks, equipments and other heavy objects and even workmen, which could be fatal.

Form-work for small/light beams and slabs

The collapse of bottom of the beam that may bring down the slab as well is a risk in such operations, which may injure the labour or supervision staff. Slender ballies without bracing are not be allowed for such works. No concreting should be allowed without bracing at 300 mm above ground and at mid way for normal beams and slabs. The bracings should be for the support of beams as well as the slabs. Direct ballies support from the ground and the practice of tying planks with binding wire to the steel reinforcement shall not be allowed. A temporary railing and properly based working platforms along the periphery of slab reduces risk to the life of labour and supervision staff.

Dismantling of Scaffoldings

Dismantled materials may fall on passer-by and workers. Workers could also get injured during the removal of such materials. Prior to dismantling of scaffoldings/working platforms, the area of operation should be closed for all outsiders. No one should be allowed within 50 mt. from the place of demolition. Helmets, safety belts and other PPE must be worn by all the workers engaged in such a work. This work requires careful handling by an experienced supervisor/work force and should be executed with utmost caution. Gradual dislodging and use of PPE is required.

Column Reinforcements

The tendency of bar-benders is to tie the vertical steel with coir rope or 8 mm steel rods as ties on all four sides of the column reinforcements. Reinforcement to columns shall be by welding MS rods with metal scaffolding to keep it in position till the final casting of RCC is done.

Fall of Objects or Debris from a Height

At bridges construction sites (or in work areas at a height above ground level) thick nylon net or hessian barriers shall be used to prevent any splinter, debris, mortar or concrete from falling onto the passers by or workmen around.

Water Storage Tanks (for General Use, Curing etc.)

A child of a worker or that of a near-by resident falling into the water tank is also a risk associated with construction sites. The water tanks therefore shall be provided with protective cover/lid with locking arrangement at every site of activity to prevent accidental drowning.

Site Cleaning

Throwing of waste materials, broken concrete pieces, brick bats, sand etc. straight from the top of a structure onto the ground can injure a worker or a passerby. Such materials should be brought to the ground with the help of lift or the use of rope over pully with a bucket.

G. OPERATION OF EXCAVATORS

- Ensure that excavators are operated by authorized persons who have been adequately trained. Prevent any unauthorized use of the excavators.
- Ensure that only experienced and competent persons are engaged in supervising all excavations and leveling activity.

- Check and maintain as per the manufacturer's manual.
- Issue relevant information, including that related to instructions, training, supervision and safe system of work in writing and provide expert supervision for guidance.
- Ensure that the operation and maintenance manuals, manufacturer's specifications, inspection and maintenance log books are provided for the use of the mechanics, service engineers or other safety personnel during periodic maintenance, inspection and examination.
- During tipping or running alongside the trenches, excavators must be provided with stop blocks. Avoid operating the machine too close to an overhang, ditch or hole, potential carving in edges, falling rocks and land slides, rough terrain with undulating obstacles.
- Excavators must be rested on firm ground after field operation away from the road
- Locate and identify underground services including telephone cables, OFC cables, sewerage and drainage lines, water supply, electrical cables etc by checking with all concerned underground utility providers.
- When reversing or in cases where the operator's view is restricted, adequate supervision and signaling arrangements shall be provided.
- Ensure that the type and capacity of the excavator are properly chosen for the intended purposes and site conditions. Never use a machine for any purposes other than it is designed for.
- Check and report for excessive wear and any breakage of the bucket, blade, edge, tooth and other working tools of the excavator and ensure replacement/ repair to avoid mishap and break down.
- Check that all linkages/hinges are properly lubricated and ensure that the linkage pins are secured. Never use improper linkage pins.
- Never dismount from or mount on a moving machine.

H. OPERATION OF TRUCKS AND DUMPERS

- Ensure that only trained, authorized and licensed drivers operate the vehicles.
- Enlist help of another worker before reversing the vehicle.
- Switch-off the engine when not in use to save fuel, prevent accidents and unnecessary noise and air pollution.
- Lower the tipping bodies when the machine is unattended, but if it is necessary to leave them in the raised position they should be blocked to prevent their fall by fixing a sturdy support below.
- Carryout periodic servicing as per the manufacturer's requirements. All records of maintenance and repairs should be in writing and available for verification.
- Keep the vehicle tidy and the cabin free from clumsy utilities, which mightobstruct the controls and create hazards.
- Follow safe driving principles including speed limits as per traffic signage.

- Avoid carrying additional passengers in the cabin or on the body of the dumper, while in field operation other than the connected workers.
- Provide stop blocks when the vehicle is tipping into or running alongside excavations or when it is parked.
- Do not overload the vehicle.
- Carry only well secured loads and use proper covers and fasteners.

I. Manual Handling and Lifting

- Avoid manual handling of heavy and hazardous objects and chemicals.
- Pre-assess the actual requirement of manpower in case of emergency situations.
- The hazardous and poisonous materials should not be manually handled without proper equipments/gears and prior declaration of the risks needs to be made to the involved workers.
- All concerned persons shall be trained in proper methods of lifting and carrying.
- In all manual operations where groups of workers are involved, a team leader with necessary training to handle the entire work force in unison has to be provided for.
- Watch and ward to control/supervise/guide movement of equipments and machineries, loading and unloading operations, stability of the stockpiled materials and irregularly shaped objects have to be provided for safety and security of workers.
- Carriageway used by the workers must be free from objects, which are dangerous.
- Loading and unloading from vehicles shall be under strict supervision.

J. ELECTRICAL HAZARDS IN CONSTRUCTION AREAS

- Statutory warning leaflets/posters are to be distributed/displayed by the Contractor in the vicinity of work sites for the benefit of all workers, officers and supervisors as well as the public, indicating the do's and don'ts and warning related to electrical hazards associated with operations to be executed/in progress.
- All wires shall be treated as live wires.
- Report about dangling wires to the site-in-charge and do not touch them.
- Only a qualified electrician should attempt electrical repairs.
- Train all workers about electrical safety.
- Shut down the equipment that is sparking or getting over heated or emitting smoke at the time of operation, if it is not the normal way of working of such machines.
- Inform technical person/s for required maintenance.
- Never used damaged wires for electrical connection.
- Demolition, tree felling and removal of overhead transmission lines shall be undertaken with strong, efficient and closely monitored arrangements to avoid accidents.

K. USE AND STORAGE OF GAS (LPG)

- Store filled gas/LPG cylinder in a secure area – mark this as a no smoking area.
- Transport, store, use and secure cylinders in upright position.
- Ensure proper ventilation at the ground level in locations where LPG is in use.
- Avoid physical damage to the cylinders.
- Never weld near the cylinder.
- Store empty cylinders secured and upright.
- Make sure that the cylinder is closed immediately after use.
- Investigate immediately if there is the smell of LPG or gas.
- Never use destenched gas/LPG on site.
- Make sure that there is no other unrelated fire in the vicinity of the cylinder.

L. GAS WELDING

- The welders and welding units should follow all the basic principles of welding for safety and security.
- Use face shield to protect the eyes.
- Use goggles, particularly when chipping slag and cutting strips.
- Use gloves long enough to protect wrists and forearms against heat, sparks, molten metal and radiation hazards.
- Use high-top boots/gum boots to prevent sparks, splinters, sharp edges of metal and hot welded strips, welding rods, electric cables etc. from injuring the legs.
- Avoid inhaling the noxious fumes and gasses from burning electrodes by using gas masks and screen of the work area to prevent the glair moving outside it.
- Keep the key hung from the regulator control for split seconds operations to stop the valve in case of any accidental damage or leakage to supply pipeline that may catch fire and cause accidents in case acetylene or LPG cylinder.
- The welding area should have sufficient openings with fixed exhaust ventilators or adequate air flow openings to remove poisonous fumes and gases.
- Take precautions of wearing hard hats or fiber helmets to prevent injury due to fall of any object and accidental injury from projections while welding.
- Welders operating above ground should have adequate safety belt secured to stable platform to prevent accidental fall or injury from the scaffold. All electrical and gas connection lines up to the welder should be sufficiently insulated and protected from sharp edges and sharp objects. These shall not come into contact with hot metal.
- Do not use gas cylinders for supporting work or as rollers.

- While using LPG or CNG cylinders for welding, follow all safety precautions as has been prescribed by the supplier company.
- Avoid fire hazards and accidents by posting safety supervisors to oversee the activities of workers.
- Do not store explosives, high inflammable materials, loose hanging overhead objects, hot welded strips etc. near gas cylinders.
- Close all valves, switches and circuits while leaving the work place under proper lock and key. In case of mobile units, proper carriage procedure have to be followed for safety and security of men and materials.

M. FIRE SAFETY PRACTICES

- Before fire breaks out
- Designate fire officers.
- Store flammable material in proper areas having adequate fire protection systems.
- Display sufficient warning signs.
- Install fire alarm wherever required and test regularly.
- Inspect fire extinguishers regularly and replace as necessary.
- Train selected personal on use of fire extinguishers
- Fire escape route should be kept clear at all times and clearly indicated
- Display escape route maps prominently on each side.
- Provide sufficient exit signs at prominent locations for directing people to the escape staircases and routes.
- Train workers about the escape route and assembly point/s.
- Carryout fire drill periodically.

When fire breaks out

- Alert all persons through fire alarms or other methods.
- Put off the fire with appropriate fire extinguishers only when you are sure that you are safe to do so.
- Escape if you are in danger through the fire escape route to assembly point.
- Call-up Fire Service.
- Fire officers to carryout head count at the assembly point.

N. NOISE HAZARDS AND ITS CONTROL

- Plan camp lay-out in a manner that ensures barriers/buffers between residential/ office units and high noise generating zones.

- Use sound meters to measure the level of noise and if it exceeds 75 dB(A), then ensure preventive measures.
- Make personnel aware of noisy areas by using suitable warning signs and insist on use of ear protectors/ear plugs to prevent excess noise affecting the workmen.
- Reduce noise at source by: use of improved equipments; regular and proper maintenance of the machinery as per the manufacturer's manual; by replacing rickety and noisy equipments and machineries. Screening locations with noise absorbing material; making changes in the process/equipment; controlling machine speeds; ensuring that two noise-generating machines are not running at the same time close to each other at same location; using cutting oils and hydraulic noise breakers; providing vibration and noise absorbing platform and firm embedding of equipments with fasteners.
- Appoint a competent person to: carryout a detailed noise assessment of the site; designate ear protection zone/s; give training/instructions on the necessary precautionary measures to be observed by site personnel including using suitable type of ear protection equipments.

O. PERSONAL PROTECTIVE EQUIPMENT

General

- Provision of personal protective equipment has to be made over and above all measures taken for removing or controlling safety hazards on a work site.
- Ensure that sufficient personal protective equipments are provided and that they are readily available for every person who may need to use them.
- The Contractor 's Project Manager shall ensure that all persons make full and proper use of the personal protective equipment provided.
- Provide instruction/s and training for the proper use and care of personal protective equipment.
- Ensure that the personal protective equipments are in good condition.
- Train workers to report unintentional damages for replacement and to always keep the personal protective equipment clean.
- PPE includes, but may not be limited to, hard hats, goggles, ear plugs, gloves, air filters/masks, boots, ropes etc.

Eye Protection

- Road construction work sites, quarries and crushers are full of dust particles, sand, splinter, harmful gases, bright light and welding arc lights, which are injurious for the eyes. Therefore, eye protection and adequate lighting in work areas is required. All workers, supervisors and inspection officers and dignitaries coming over for study of works should be compelled to wear eye protecting glasses/goggles properly fitting the eye sockets to prevent damage due to dust, gases and other particles.
- Head Protection

- Hard hats are compulsory for all workers, supervisors and managers/officials while working and/or inspecting a work sites.
- Hard hat areas shall be demarcated clearly.
- Hearing Protection
- Provide ear plugs or ear muffs to the workers and to those who need to get in and out of a high noise area frequently. Use re-usable earplugs when the reduction required (15-25 dBA) is not excessive. Use earmuffs where a large attenuation of upto 40 dBA is demanded.
- Do not use dry cotton wool for hearing protection because it doesn't provide any such protection.
- Provide disposable ear plugs for infrequent visitors and ensure that these are never re-used.
- Replenish ear plugs from time to time for those who need to work continuously for a long period in a high noise area/s.
- Use ear muffs with replaceable ear cushions because they deteriorate with age or may be damaged in use.
- Avoid wearing spectacles with ear muffs.
- Use soap and water or the recommended solvent for cleaning ear muffs.
- Respiratory (Protective) Equipment
- Wear suitable maks for protection when there is a potential for small particles entering the lungs, e.g. emptying of cement bags, working at crusher sites etc.
- Provide training to all persons using the masks/respirators for their correct fitting, use, limitations and symptoms of exposure.
- Clean and inspect all respirators before and after use.
- Store respirators properly when not in use.
- Safety Footwear
- Wear suitable footwear for work
- Use safety footwear on site or in other dangerous areas.
- Wear suitable safety shoes or ankle boots when working anywhere where there is high risk of foot injuries from slippery or uneven ground, sharp objects, falling objects etc.
- All safety footwear, including safety shoes, ankle boots and rubber boots, should be fitted with steel toecaps.
- Avoid wearing flip flops, high heeled shoes, slippers, light sport shoes in situations where there is a risk of foot injury.
- Keep shoelace knots tight.
- Hand Protection

- Wear suitable gloves for selected activities such as welding, cutting and manual handling of materials and equipment.
- Do not wear gloves where there is a risk of them becoming entangled in moving parts of machinery.
- Wash hands properly with disinfectant soap and clean water before drinking or eating.
- Wash hands immediately after each operation on site when the situation warrants.

P. FIRST AID

- Provide first aid boxes at every work site in a cool and shaded place.
- Ensure that training on the use of the first aid box is provided to at least every supervisor on the site.
- Display the list of persons along with their contact numbers who are trained on providing first aid.
- Ensure that every first aid box is marked "First Aid" in English and in local language.
- Check for expiry dates and replace the contents, as necessary.
- Maintain a register on health records including injuries/accidents.

Q. ACCIDENT INVESTIGATIONS

- Carryout the investigation/s as quickly as possible.
- Investigation should be carried out both internally as well as through third party.
- Conduct interviews with as many witnesses as necessary including the affected persons and supervising officials.
- Do not rely on any one/limited source of evidence.
- Check all the log books, stock registers, issue registers, movement registers on site
- safety regulations, traffic signals and signal men activities, signage, as well as other field positions and keep a record of all investigations through audio-visual and electronic medium for presenting an evaluation of the incident/s.
- After completion of the investigation/enquiry, a summary of the facts recorded, sequence of happenings, persons-in-charge, persons examined, equipments and machineries tested, follow-up of action as per legal requirements, copy of station diary entry, hospital entry, safety regulations etc. to be prepared with a comparative analysis for proper assessment.

Annexure 3. 10. Guidelines for Preparation of Traffic Management Plan

The Contractor shall at all times carry out work on the road in manner creating least interference to the flow of traffic with the satisfactory execution. For all works involving improvements to the existing state highway, the Contractor shall, in accordance with the directives of the CSC, provide and maintain, during execution of the work, a passage for traffic either along a part of the existing carriageway under improvement, or along a temporary diversion constructed close to the state highway. The Contractor shall take prior approval of the CSC regarding traffic arrangements during construction.

A. ENSURING TRAFFIC SAFETY AND CONTROL

Where subject to the approval of the Engineer the execution of the works requires temporary closure of road traffic use, the Contractor shall provide and maintain temporary traffic diversions. The diversions shall generally consist of 200 mm thickness of gravel 4.5 meters wide laid directly upon natural ground and where any additional earthworks are required for this purpose that will be provided under the appropriate payment items.

Where the execution of the works requires single-lane operation on public road, the Contractor shall provide and maintain all necessary barriers, warning signs and traffic control signals to the approval of the Engineer.

With the exception of temporary traffic arrangements or diversions required within the first 4 weeks of the Contract, the Contractor shall submit details of his proposals to the Engineer for approval no less than 4 weeks prior to the temporary arrangement or diversion being required. Details of temporary arrangements or diversions for approval as soon possible after the date of the Letter of Acceptance.

The colour, configuration, size and location of all traffic signs shall be in accordance with the code of practice for road sign. In the absence of any detail or for any missing details, the signs shall be provided as directed by the Engineer (CSC).

The Contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, marking, flags, lights and flagmen as may be required by the Engineer for the formation and protection of traffic approaching or passing through the section of the road under improvement. Before taking up any construction, an agreed phased programme for the diversion of traffic or closer of traffic on the road shall be drawn up in consultation with the SE.

At the points where traffic is to deviate form its normal path (whether on temporary diversion or part width of the Carriageway) the lane width path for traffic shall be clearly marked with the aid of pavement markings, painted drums or a similar device to the directions of the SE. At night, the passage shall be delineated with lanterns or other suitable light source.

One-way traffic operation shall be established whenever the traffic is to be passed over part of the carriageway inadequate for two-lane traffic. This shall be done with the help of temporary traffic signals or flagmen kept positioned on opposite sides during all hours. For regulation of traffic, the flagmen shall be equipped with red and green flags and lanterns/lights.

On both sides, suitable regulatory / warnings signs as approved by the SE shall be installed for the guidance of road users. On each approach, at least two signs shall be put up, one close to the point where transition of carriageway begins and the other 120 m away. The signs shall be of design and of reflectory type, if so directed by SE.

Upon completion of the works for which the temporary traffic arrangements or diversions have been made, the Contractor shall remove all temporary installations and signs and reinstate all affected roads and other structures or installations to the conditions that existed before the work started, as directed by the Engineer.

B. MAINTENANCE OF DIVERSIONS AND TRAFFIC CONTROL DEVICES

Signs, lights, barriers and other traffic control devices, as well as the riding surface of diversion shall be maintained in a satisfactory condition till such time they are required as directed by the SE. The temporary traveled way shall be kept free of dust by frequent applications of water, if necessary. The signages and devices required includes the following:

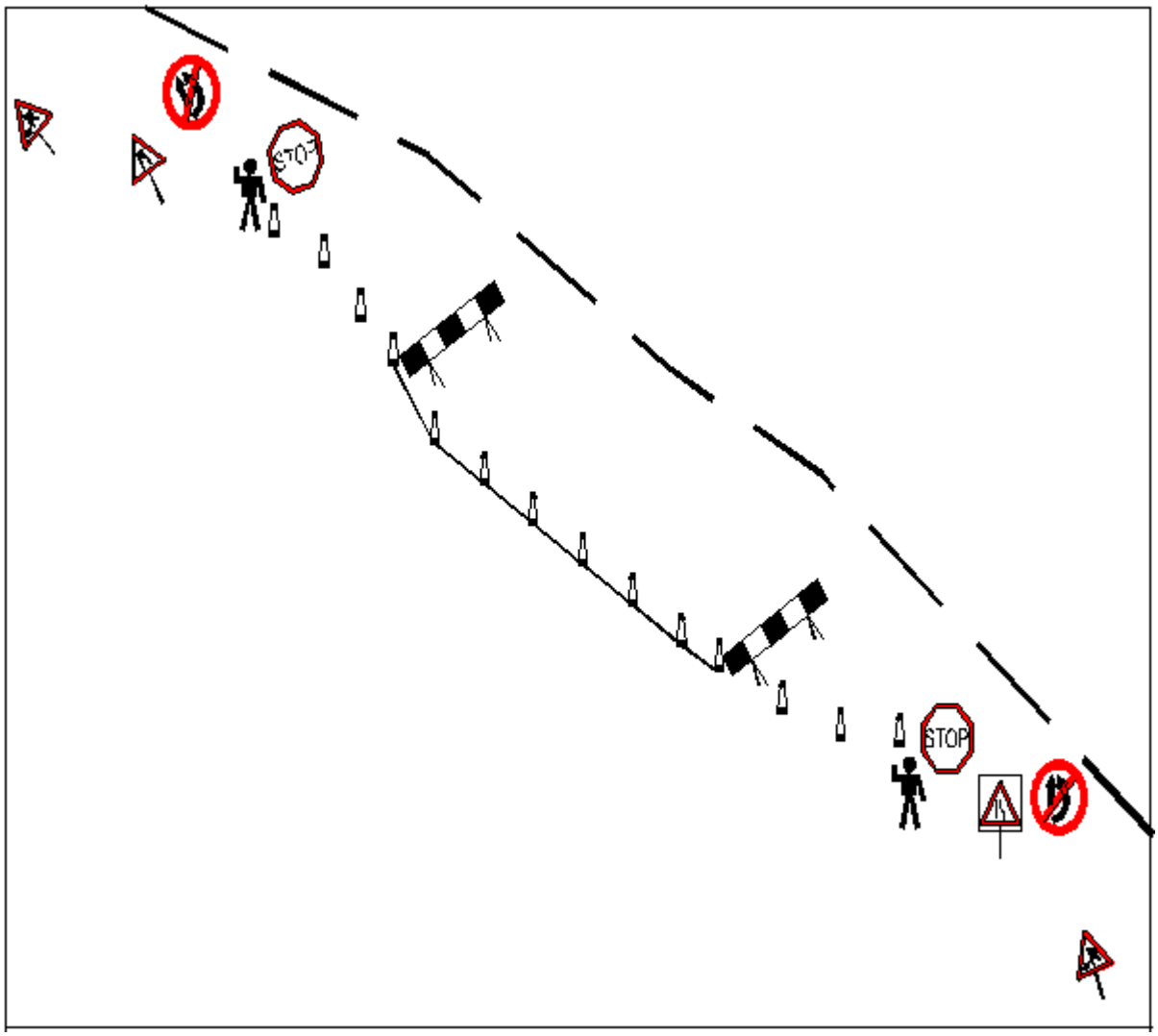
- Barricading
- Men at work
- Keep Left
- Go slow
- Flag men
- Narrow signs
- Lantern(Amber Blinker)
- Traffic control Lights
- Cones

Safety jackets and helmets should be provided to all the workers/ Engineers working on the road.

Fixed mobile solid barricades must be placed between the workmen and traffic or pedestrian and traffic.

All the safety signs should be according to IRC: 67 and IRC: SP: 55: 2001

Examples of some good practice in traffic control during construction are shown in the figures below.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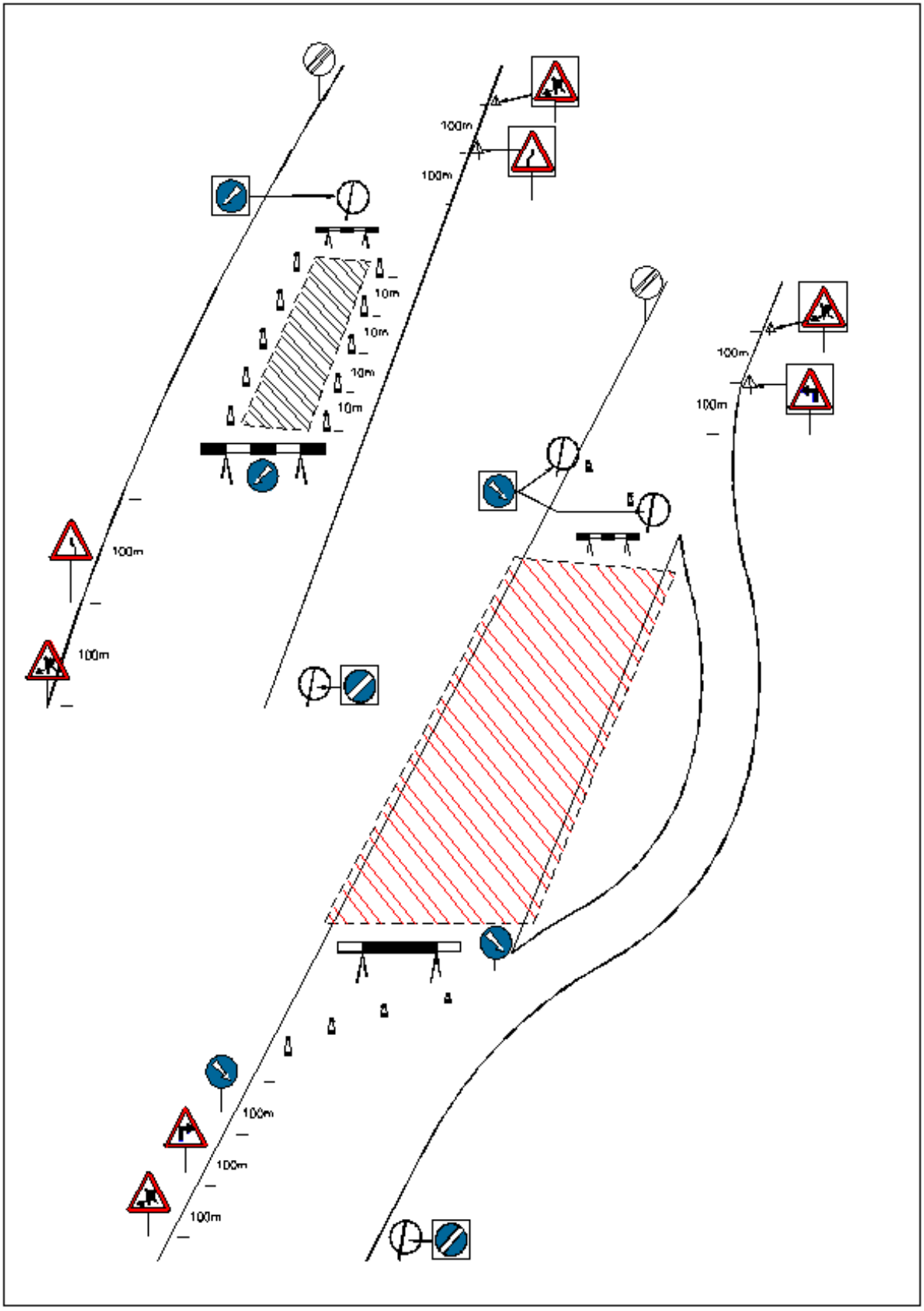
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Annexure 3. 11. Guidelines for Storage, Handling, Use and Emergency Response for Hazardous Substances

A. HANDLING HAZARDOUS SUBSTANCES (INCLUDING CHEMICALS)

- As far as practicable the hazardous materials will be stockpiled under proper mechanical loading, unloading and stacking aided by manual labour where necessary.
- Exercise great care in the storage and use of chemicals because they may be explosive, poisonous, corrosive or combustible.
- Separate different chemicals physically and store accordingly after proper labeling.
- Stock taking of all hazardous will be mandatory together with enforcement of manufacturer's or supplier's safety standard/s and drill exercises.
- New and less known chemicals and building materials, for which toxicological studies are wanted, need to be properly evaluated prior to their inclusion in the materials list.
- All containers should be clearly labeled to indicate contents.
- Maintain the Material Safety Data Sheet of all chemicals for reference on safety precautions to be taken and the use of suitable PPE.
- Ensure use of correct personal protective equipment before allowing workers to handle chemicals.
- When opening containers, ensure holding of a rag over the cap/lid or use of safety gloves, as some volatile liquids tend to spurt up when released.
- Eye fountain, emergency shower and breathing apparatus should be available near the workplace.
- Ensure immediate medical attention in case of spill/splash of a chemical.
- Safety instructions for handling emergency situations shall be displayed prominently at both the storage and use locations.

B. TRANSPORTATION, REFUELING AND MAINTENANCE PROCEDURE

- Truck or suitable containers will bring in all fuel and fluids.
- There will be no storage of fuel, oil or fluids within 200m of a water line.
- Prior to re-fueling or maintenance, drip pans and containment pans will be placed under the equipment.
- Absorbent blankets may also be required to be placed under the equipment and hoses where there is a possibility of spillage to occur.
- All used oils or fluids will be properly contained and transported to appropriately licensed (authorized) disposal facilities.
- Following re-fueling and maintenance, the absorbent blankets (if any) and spill pans will be picked up and the fuel truck or container moved outside of the 100m (or 50m) wide area.

C. EMERGENCY SPILL PROCEDURE

- Should a spill occur, either through accidental spillage or equipment failure, the applicable emergency spill procedure as outlined in sections below and/or as directed by the manufacturer/supplier shall be followed:

Spill Procedure (Inside a Stream)

- In the case of a spill, overflow or release of fluid into the stream waterway (whether water is flowing during the spill or not), do what is practical and safely possible to control the situation, while sending SOS for help from the technical wings and fire brigade or any other govt. agency.
- Stop the flow
- Stop the release into the waterway
- Shut down the equipments
- Close valves and pumps.
- Plug leaking of damage hosepipes or containers with suitable sealants or temporary plugs at the holes.

Remove Ignition Sources

- Cut off the supply sources and shut down the sources of power supply.
- Cordon up the area and salvage the spilled materials for recycling or disposal as would be suggested by the technical experts or as per the manufacturer's guidelines for the product. In case of inflammable materials, mobile phones, electrical switches and heat generating machines, sparking electrodes etc. shall not be operated.
- Portable fire extinguishers need to be kept handy in such vehicles for immediate use as a damage control measure.

Clean-up and Disposal

- Emergency Services shall be engaged for the containment, clean-up and disposal of contaminants released into the environment.

Reporting

- The Contractor 's Environmental Officer will document the event and submit the reports to the Engineer, the Client and appropriate regulatory agencies like the Pollution Control Board.

Procedure Review

- The Engineer will review the report, determine if changes are required to be incorporated in the plan of activity under the revised guidelines and recommendation/s that have been suggested by the technicians/manufacturer/ supplier /fire brigade /SPCB /environment officer of the PIU, as the case may be.

Spill Procedure (On Land)

- All types of spills are hazardous - whether liquid or amorphous or solid and accordingly the spill has to be dealt with. For liquids, sealing the leakage or emptying the container into another empty vessel may be considered. For solid or semi-solid or viscous products, special salvage equipments are to be used. For fine particles and water soluble chemicals, neutralizing or scraping the affected soil from the area has to be resorted to with mechanical removal and depositing at a safe site as would be recommended by experts.

Notification

- All legal authorities such as civil administration including the district Collector, the sub-divisional officer, Tehsildar, the local SHO of the police station, the SP, Divisional Forest Officer, the Inspector of Factories and Boiler, the SPCB authority monitoring the pollution in the area, site engineer/supervision consultant and environmental officer of PWD/PIU, local gram panchayat and people's representatives have to be informed about the incident, the probable damage, current and after effects, precautionary measures to be taken and already taken and restrictions imposed on movement of men, material, live stock etc in an around the site of spill.

Cleanup and Disposal

- The Engineer's Environmental Officer will ensure that a proper cleanup and disposal method is determined. Absorbent pads will soak up the spilled material. The pads will be contained and removed from site for disposal at a licensed (authorized) facility.

Reporting

- The Contractor 's Environmental Officer will document the event and submit reports to the Engineer, the Client and appropriate regulatory agencies like the Pollution Control Board(s).

Procedure Review

- The Engineer will review the report; determine, if changes are required to procedures and; recommend implementation of all required changes.

Annexure 3. 12. Reporting Format for Identification of Construction Camp Site

A	**Project Details**		Date of reporting:	
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the projec			
B	**Site Details**			
1.	Place Name		Landmark	
2.	Name of Panchayath / Municipality		Revenue Village	
3.	Taluk		District	
4.	Nearest Chainage (km) of the project road		location w.r.t. project road	LHS/ RHS
5.	Area of site		Current land use	
6.	Ownership of the land	Owned / leased	Survey no.	
7.	If leased / rented, name, address and contact details of owner			
8.	Distance* from any major settlement or village			
9.	Distance from any major surface water course or body			
10.	Distance from ecologically sensitive areas			
11.	Distance from the Project road			
12.	Width and type (paved or unpaved) of access road			
13.	No of trees with girth> 0.3m			

14.	No of trees to be cut		
15.	Is top soil conservation required (Yes/ No)		
List of enclosures:	(a) Location map		
	(b) Layout plan		
	(c) Photographs of the site		
	(d) List of machinery, equipments and vehicles to be used		
	(e) List of schools and hospitals with in 200 mts distance from the boundary of the camp		
C. Submission Details	**Submitted by (Environment & Safety Engineer of Contractor)**	**Approved / Rejected by (Environmental Officer of CSC)**	
Signature & date			
Name			
Designation			
Remarks by CSC			

** All distances are to be measured from the boundary of the site.*

Note: Contractor has to fill and submit this format to the CSC upon identification of each construction camp site. Subsequently, the EO of CSC has to visit the site and approve / reject the site with reasons. The EO of CSC has to give a copy of this format to the Contractor after his approval / rejection with remarks. On approval of a site, the Contractor has to prepare the Management and Redevelopment Plan for this site as per the Guidelines given in EMP and submit to CSC for approval.

Annexure 3. 13. Reporting Formats for Identification of Labour Camp Site

A	**Project Details**		Date of reporting:	
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
B	**Site Details**			
1.	Place Name		Landmark	
2.	Name of Panchayath / Municipality		Revenue Village	
3.	Taluk		District	
4.	Nearest Chainage (km) of the project road		location w.r.t. project road	LHS/ RHS
5.	Area of site		Current land use	
6.	Ownership of the land	Owned / leased	Survey no.	
7.	If leased, name, address and contact details of owner			
8.	Distance* from any major settlement or village			
9.	Distance from any major surface water course or body			
10.	Distance from ecologically sensitive areas			

11.	Distance from the Project road	
12.	Width and type of access road	
13.	No of trees with girth> 0.3m	
14.	No of trees to be cut	
15.	Is top soil conservation required (Yes/ No)	

List of enclosure:	Location map	
	Layout Plan	
	Photographs of the site	

C. Submission Details	**Submitted by (Environment & Safety Engineer of Contractor)**	**Approved / Rejected by (Environmental Officer of CSC)**
Signature & date		
Name		
Designation		
Remarks by CSC		

** All distances are to be measured from the boundary of the site.*

Note: Contractor has to fill and submit this format to the CSC upon identification of each Labour camp site. Subsequently, the EO of CSC has to visit the site and approve / reject the site with reasons. The EO of CSC has to give a copy of this format to the Contractor after his approval / rejection with remarks. On approval of a site, the Contractor has to prepare the Management and Redevelopment Plan for this site as per the Guidelines given in EMP and submit to CSC for approval.

Annexure 3. 14. Reporting Format for Identification of Quarry and Stone Crusher Site

A	**Project Details**		Date of reporting:	
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
B	**Site Details**			
1.	Place Name		Landmark	
2.	Name of Panchayath / Municipality		Revenue Village	
3.	Taluk		District	
4.	Nearest Chainage (km) of the project road		location w.r.t. project road	LHS/ RHS
5.	Area of site		Current land use	
6.	Ownership of the land	Owned / leased	Survey no.	
7.	If leased, name, address and contact details of owner			
8.	Type of material available and its quantity			
9.	Distance* of the site from:			
	(i) any major settlement or village			
	(ii) any major surface water course or body			
	(iii) any bridge, water supply system, infiltration well or pumping installation			
	(iv) any public road			
	(v) ecologically sensitive areas			
	(vi) nearest quarry / stone crusher			
10.	Distance from project road			

11.	Width and type of access road		
12.	No of trees with grid >0.3m		
13.	No of trees to be cut		
14.	Is top soil conservation required: Yes/ No		
15.	Place identified for top soil conservation		
List of enclosure:		(a) Location map	
		(b) Layout plan	
		(c) Photographs of the site	
		(d) List of schools and hospitals with in 200 mts distance from the boundary of the site	

C. Submission Details	**Submitted by (Environment & Safety Engineer of Contractor)**	**Approved / Rejected by (Environmental Officer of CSC)**
Signature & date		
Name		
Designation		

Remarks by CSC

** All distances are to be measured from the boundary of the site.*

Note: Contractor has to fill and submit this format to the CSC upon identification of each quarry and stone crusher site. Subsequently, the EO of CSC has to visit the site and approve / reject the site with reasons. The EO of CSC has to give a copy of this format to the Contractor after his approval / rejection with remarks. On approval of a site, the Contractor has to prepare the Management and Redevelopment Plan for this site as per the Guidelines given in EMP and submit to CSC for approval.

Annexure 3. 15. Reporting Format for Identification of Borrow Areas

A	**Project Details**		Date of Reporting:	
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
B	**Site Details**			
1.	Place Name		Landmark	
2.	Name of Panchayath / Municipality		Revenue Village	
3.	Taluk		District	
4.	Nearest Chainage (km) of the project road		location w.r.t. project road	LHS/ RHS
5.	Area of site		Current land use	
6.	Ownership of the land	Owned / leased	Survey no.	
7.	If leased, name, address and contact details of owner			
8.	Distance* from any major settlement or village			
9.	Distance from any major surface water course or body			
10.	Distance from ecologically sensitive areas			
11.	Distance from the Project road			
12.	Width of and type of access road			
13.	No of trees with girth> 0.3m			
14.	No of trees to be cut			
15.	Is top soil conservation required (Yes/ No)			
List of enclosure:		Location map		
		Layout Plan		
		Photographs of the site		

C. Submission Details	**Submitted by (Environment & Safety Engineer of Contractor)**	**Approved / Rejected by (Environmental Officer of CSC)**
Signature & date		
Name		
Designation		
Remarks by CSC		

** All distances are to be measured from the boundary of the site.*

Note: Contractor has to fill and submit this format to the CSC upon identification of each borrow area. Subsequently, the EO of CSC has to visit the site and approve / reject the site with reasons. The EO of CSC has to give a copy of this format to the Contractor after his approval / rejection with remarks. On approval of a site, the Contractor has to prepare the Management and Redevelopment Plan for this site as per the Guidelines given in EMP and submit to CSC for approval.

Annexure 3. 16. Reporting Format for Identification of Debris Disposal Site

A	**Project Details**		Date of Reporting:	
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
B	**Site Details**			
1.	Place Name		Landmark	
2.	Name of Panchayath / Municipality		Revenue Village	
3.	Taluk		District	
4.	Nearest Chainage (km) of the project road		location w.r.t. project road	LHS/ RHS
5.	Area of site		Current land use	
6.	Ownership of the land	Owned / leased	Survey no.	
7.	If leased, name, address and contact details of owner			
8.	Distance* from any major settlement or village			
9.	Distance from any major surface water course or body			
10.	Distance from ecologically sensitive areas			
11.	Distance from the project road			
12.	Width and type of access road			
13.	No of trees with girth> 0.3m			
14.	No. of trees to be cut			
15.	Is top soil conservation required (Yes/ No)			

List of enclosure:	Location map	
	Layout Plan	
	Photographs of the site	

C. Submission Details	**Submitted by (Environment & Safety Engineer of Contractor)**	**Approved / Rejected by (Environmental Officer of CSC)**
Signature & date		
Name		
Designation		
Remarks by CSC		

** All distances are to be measured from the boundary of the site.*

Note: Contractor has to fill and submit this format to the CSC upon identification of each debris disposal site. Subsequently, the EO of CSC has to visit the site and approve / reject the site with reasons. The EO of CSC has to give a copy of this format to the Contractor after his approval / rejection with remarks. On approval of a site, the Contractor has to prepare the Management and Redevelopment Plan for this site as per the Guidelines given in EMP and submit to CSC for approval.

Annexure 3. 17. Reporting Format for Identification of Sources of Water for Construction

A	**Project Details**		Date of Reporting:	
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
B	**Site Details**			
1.	Place Name		Landmark	
2.	Name of Panchayath / Municipality		Revenue Village	
3.	Taluk		District	
4.	Nearest Chainage (km) of the project road		location w.r.t. project road	LHS/ RHS
5.	Type of water body (River / Canal / lake)			
6.	Existing users			
7.	Ownership of the water body			
8.	Authority responsible for giving permission			
9.	If private, name, address and contact details of owner			
10.	Distance from project road			
11.	Width and type of access road			

List of enclosure:	Location map	
	Photographs of the site	

C. Submission Details	**Submitted by** **(Environment & Safety Engineer of Contractor)**	**Approved / Rejected by** **(Environmental Officer of CSC)**
Signature & date		
Name		
Designation		
Remarks by CSC		

***** *All distances are to be measured from the boundary of the site. Ground water should not be used for construction.*

Note: Contractor has to fill and submit this format to the CSC upon identification of each water source for construction. Subsequently, the EO of CSC has to visit the site and approve / reject the site with reasons. The EO of CSC has to give a copy of this format to the Contractor after his approval / rejection with remarks.

Annexure 3. 18. Format for Register of Complaints and it's Reporting

A	**Project Details**	**Information**			
1.	Name of project stretch and link no.				
2.	Name and address of the Contractor				
3.	Contract date and duration				
B	**Details of Complaint Received**		**Site Name**		
Sl. No.	**Date of Complaint**	**Name and address of person with contact details**	**Complaint**	**Action taken with date**	**Signature of ESE of Contractor**
1					
2					
3					

A register in this format shall be maintained at each site office of the Contractor . This same format shall be used to compile and report the details of complaints received at all sites to the CSC along with the Monthly Report of the Contractor . The EO of CSC has to give instruction to the Contractor , if any further action has to be taken on any complaint.

Annexure 3. 19. Format for Register of Sites Opened and Closed And it's Reporting

A.	Project Details	Information
1.	Name of project stretch and link no.	
2.	Name and address of the Contractor	
3.	Contract date and duration	

B.	Site Details										
Sl. No.	**Site Opening Date**	**Type of Site***	**Address of Site (Place name, Landmark, Revenue Village, Survey No., Panchayath, Taluk and District)**	**Name and Address of the Owner**	**List of Clearances Required**	**Issue Date of each Clearance**	**Expiry Date of each Clearance**	**Site Closing Date**	**Redevelopment Status**	**Remarks**	**Signature of ESE of Contractor**
1											
2											

* *Construction Camp / Labour camp / Quarry Area and Stone Crusher Unit / Borrow Area / Debris Disposal Site / Water Source.*

A site should be opened only after submitting the Management and Redevelopment Plan prepared as per the Guidelines given in EMP and got it approved by the EO of the CSC. A register in this format (preferably in A3 size paper) should be maintained by the Contractor for each road. This same format shall be used to report the details of sites opened and closed to the CSC along with the Monthly Report of the Contractor . The EO of CSC has to give instruction to the Contractor if any clearance is pending for any site.

Annexure 3. 20. Checklist for Monitoring of Construction Camp Management

A	**Project Details**	**Date of Monitoring:**		
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
5.	Name of Construction Camp with sl. no. in Register of Sites			
B.	**Monitoring Details**			
Sl. No.	**Environmental Management Measures**	**CSC's observation (Yes / No / Not Applicable)**	**Corrective Actions Proposed**	**Remarks**
1.	Whether concrete flooring and oil interceptors are provided for hot mix plant area and work shop, vehicle washing and fuel handling area?			
2.	Are all the first aid facilities provided in the camp?			
3.	Whether the plant is located in such a way that there are no residences, public institutions or hospital with in a radius of 250 M from the centre of the plant?			
4.	Whether the vehicle movement in and out of the camp is in a controlled manner?			

5.	Does water in cross drainage channels block?			
6.	Whether all the plant and machineries are well maintained and regularly serviced?			
7.	Whether all the drains and channels are covered?			
8.	Whether a green belt is provided along the periphery of camp?			
9.	Whether water is stored for dust suppression in the camp?			
10.	Whether sanitation facilities are provided for male and female?			
11.	Whether separate garbage bins are provided to collect the garbage?			
12.	Whether septic tanks with soak pits are provided?			
13.	Whether the location of soak pit is in such away that it does not pollute the ground water?			
14.	Whether a qualified safety officer is appointed for ensuring safety?			
15.	Whether noise barriers near sensitive receptors are provided?			
16.	Whether personal protective equipments are provided?			

17.	Whether top soil conservation has been undertaken?			
18.	Whether warning sign boards are set up at the entrance gate for the public?			
19.	Whether all applicable clearances are obtained and valid till date?			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Officer of the CSC with date	

Note: The Environmental Officer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for each Construction Camp Quarterly. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor . CSC has to attach this format to the Quarterly Report to be submitted to PMT, with details of corrective action taken by the Contractor .

Annexure 3. 21. Checklist for Monitoring of Labour Camp Management

A	**Project Details**	**Date of Monitoring:**		
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
5.	Name of Labour Camp with sl. no. in register of sites			
B	**Monitoring Details**			
Sl. No.	**Environmental Management Measures**	**CSC's observation (Yes / No / Not Applicable)**	**Corrective Actions Proposed**	**Remarks**
1.	Whether the camps are floored with concrete?			
2.	Are all the first aid facilities provided in the camp?			
3.	Whether the camp is located in such a way that there are no residences, public institutions or biosensitive area with in a radius of 500 M from the camp?			
4.	Whether the vehicle movement in and out of the camp is in a controlled manner?			
5.	Whether LPG for cooking is provided?			

6.	Whether safe drinking water is provided?			
7.	Whether all the drains and channels are covered?			
8.	Whether a green belt is provided along the periphery of camp?			
9.	Whether day care centres are provided with in the camp?			
10.	Whether sanitation facilities are provided separately for male and female?			
11.	Whether separate garbage bins are provided to collect the garbage?			
12.	Whether septic tanks with soak pits are provided?			
13.	Whether the location of soak pit is in such a away that it does not pollute the ground water?			
14.	Whether a qualified safety officer is appointed for ensuring safety?			
15.	Whether proper fencing of the camp is done?			
16.	Whether the workers are well aware of cleanliness, hygiene, community livings, AIDS etc.?			

17.	Whether top soil conservation has been undertaken?			
18.	Whether all applicable clearances are obtained and valid till date?			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Officer of the CSC with date	

Note: The Environmental Officer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for each Labour Camp Quarterly. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor . CSC has to attach this format to the Quarterly Report to be submitted to PMT, with details of corrective action taken by the Contractor .

Annexure 3. 22. Checklist for Monitoring of Quarry and Stone Crusher Management

A	**Project Details**	**Date of Monitoring:**		
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
5.	Name of Quarry & Crusher with sl. no. in register of sites			
B	**Monitoring Details**			
Sl. No.	**Environmental Management Measures**	**CSC's observation (Yes / No / Not Applicable)**	**Corrective Actions Proposed**	**Remarks**
1.	Whether the crusher units and/or other dust-producing units are housed in a building with a wall of minimum 23 cm thickness and with suitable roofing?			
2.	Whether quarry site is located at a distance of minimum 500 mts. from human settlement, railway line, national highway, state highway, eco-sensitive area or district road*?			

3.	Whether stone quarry is located at a minimum distance of 50mts. from a water body[4]?			
4.	Whether the vehicle movement in and out of the camp is in a controlled manner?			
5.	Whether a dust extraction with collection system is provided in the crusher unit and all transfer points?			
6.	Whether safe drinking water is provided for the workers?			
7.	Whether a dust extraction unit with collection system is provided in the crusher unit and all transfer points?			
8.	Whether a green belt is provided along the periphery of quarry?			
9.	Whether adequate systems with water spray and sprinkling is provided for dust suppression?			
10.	Whether the roads inside the crusher premises is tarred or concreted?			
11.	Whether separate garbage bins are provided to collect the garbage?			
12.	Whether the crusher, impactor and other connecting unit working time is restricted to day time (6 am to 6 pm)?			

[4] If this is not possible, given the topographical features of the region, pl specify the reasons clearly.

13.	Whether dust sealing arrangement is provided in the impactor to avoid fugitive emission?			
14.	Whether the ambient sound level (Leq) at a distance of 1 m away from the boundary of the site is with in 55 dB(A)?			
15.	Whether the occupier is conducting air monitoring on the suggested frequency?			
16.	Whether contour trenches are made to control soil erosion?			
17.	Whether workers are properly trained?			
18.	Whether sign boards of size 6' x 4' mentioning the project details and Contractor 's details are placed for public?			
19.	Whether the stack height of the D.G set is adequate?			
20.	Whether arrangement made for avoiding fugitive emission from plants/ premises are adequate?			
21.	Whether natural drainage patterns are kept clear without not alteration or blockage?			
22.	Whether top soil conservation has been undertaken?			
23.	Whether all applicable clearances are obtained and valid till date?			

Signature of Environment and Safety Engineer (ESE) of the Contractor with date	Signature of Environmental Officer of the CSC with date
Note: The Environmental Officer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for each Quarry & Crusher Quarterly. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor . CSC has to attach this format to the Quarterly Report to be submitted to PMT, with details of corrective action taken by the Contractor .	

Annexure 3. 23. Checklist for Monitoring of Borrow Area Management

A	**Project Details**	**Date of Monitoring:**		
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
5.	Name of Borrow Area with sl. no. in register of sites			
B	**Monitoring Details**			
Sl. No.	**Environmental Management Measures**	**CSC's observation (Yes / No / Not Applicable)**	**Corrective Actions Proposed**	**Remarks**
1.	Whether the work at night is fully avoided?			
2.	Whether the approach road to the borrow area well maintained?			
3.	Whether the necessary traffic sign board is kept to control the traffic flow?			
4.	Whether any record is kept for the number of trees cut?			

5.	Whether a record on total quantity of earth evacuated is maintained?			
6.	Whether all waste materials from the borrow area is properly disposed?			
7.	Whether the relaying of the preserved top soil is carried out?			
8.	Whether required signages for the protection of the works or safety and convenience of public provided?			
9.	Whether effective measures are taken to control nuisance and disturbance arising from the execution work?			
10.	Whether the excavation is carried out in such a manner that the activity will not damage adjacent properties or cause contamination of nearby stream or other water bodies?			
11.	Whether the land is leveled after completion of work?			
12.	Whether the borrow pits are redeveloped?			
13.	Whether water logging is avoided?			
14.	Whether arrangements are made for regular sprinkling of water?			

15.	Whether top soil conservation has been undertaken?			
16.	Whether all applicable clearances are obtained and valid till date?			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Officer of the CSC with date	

Note: The Environmental Officer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for each Borrow Area Quarterly. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor . CSC has to attach this format to the Quarterly Report to be submitted to PMT, with details of corrective action taken by the Contractor .

Annexure 3. 24. Checklist for The Monitoring of Debris Disposal Site Management

A	Project Details	Date of Monitoring:		
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
5.	Name of Debris Disposal Site with sl. no. in register of sites			
B	**Monitoring Details**			
Sl. No.	**Environmental Management Measures**	**CSC's observation (Yes / No / Not Applicable)**	**Corrective Actions Proposed**	**Remarks**
1.	Whether the construction operations are carrying out in such a manner that no waste material is dumped or disposed off in an unhealthy manner that causes any environmental hazard?			
2.	Whether the debris forming work close to the streams and water bodies are generally avoided during the monsoon period?			
3.	Whether the debris disposal site is at least 200 meter away from the surface water body?			

4.	Whether the debris disposal site is at least 500 meter away from the ecologically sensitive are, residential area or main road?			
5.	Whether the debris disposal along the water courses and close to the drainage channels are in such a manner that it do not cause any blockage to the flow of water?			
6.	Whether the bituminous waste is used as a surfacing material to the access roads to base camps, quarries, borrow area, temporary diversion, haulage routes etc.?			
7.	Whether the waste disposal details are submitted to the CSC in the prescribed format?			
8.	Whether the spoils from excavation of the river bed are disposing off at specified area suggested by the engineers?			
9.	Whether the debris generated due to dismantling of existing permanent structure is reused in the temporary diversion?			
10.	Whether the preserved topsoil is used for redevelopment of the area?			
11.	Whether green belt is developed ?			

12.	Whether all applicable clearances are obtained and valid till date?			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Officer of the CSC with date	

Note: The Environmental Officer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for each Debris Disposal Site Quarterly. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor . CSC has to attach this format to the Quarterly Report to be submitted to PMT, with details of corrective action taken by the Contractor .

Annexure 3. 25. Checklist for Monitoring of Redevelopment of Construction Camp Site

A	**Project Details**	**Date of Monitoring:**		
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
5.	Name of Construction Camp with sl. no. in register of sites			
B	**Monitoring Details**			
Sl. No.	**Environmental Management Measures**	**CSC's observation (Yes / No / Not Applicable)**	**Corrective Actions Proposed**	**Remarks**
1.	Are all the temporary structures cleared as per the list in the redevelopment plan?			
2.	Are all building debris, garbage, night soils and POL waste disposed off safely?			
3.	Are all disposal pits or trenches filled, disinfected and effectively sealed off?			
4.	Are the facilities that could be put to re-use maintained well ?			
5.	Are all the spills within the camp site effectively disposed off from the site?			

6.	All the area within the camp site is leveled and spread over with stored top soil.			
7.	Has the residual top soil been utilized effectively ?			
8.	Has the entire camp area been made clean and tidy without disturbing the adjacent lands?			
9.	Are the plantations / green belt along the boundary of the camp maintained well ?			
10.	Are the 'before' and 'after' scenarios of the site documented through photographs and submitted to CSC?			
11	Are the conditions mentioned by the owner in the agreement adhered to ?			
12.	If not, mention the details of the conditions that are not adhered to and further steps to be taken.			
13.	Can 'works completion' certificate be issued to this site ?			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Officer of the CSC with date	

Note: The Environmental Officer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for the redevelopment of each Construction Camp Site as and when it is closed. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor . CSC has to attach this format to the Quarterly Report to be submitted to PMT, with details of corrective action taken by the Contractor .

Annexure 3. 26. Check List for Monitoring of Redevelopment of Labour Camp Site

A	**Project Details**	**Date of Monitoring:**		
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
5.	Name of Labour Camp with sl. no. in register of sites			
B	**Monitoring Details**			
Sl. No.	**Environmental Management Measures**	**CSC's observation (Yes / No / Not Applicable)**	**Corrective Actions Proposed**	**Remarks**
1.	Are all the temporary structures cleared as per the list in the redevelopment plan?			
2.	Are all building debris, garbage, night soils and POL waste disposed off safely?			
3.	Are all disposal pits or trenches filled, disinfected and effectively sealed off?			
4.	Are the facilities that could be put to re-use maintained well ?			
5.	Are all the spills within the camp site effectively disposed off from the site?			

6.	All the area within the camp site is leveled and spread over with stored top soil.			
7.	Has the residual top soil been utilized effectively ?			
8.	Has the entire camp area been made clean and tidy without disturbing the adjacent lands?			
9.	Are the plantations / green belt along the boundary of the camp maintained well ?			
10.	Are the 'before' and 'after' scenarios of the site documented through photographs and submitted to CSC?			
11	Are the conditions mentioned by the owner in the agreement adhered to ?			
12.	If not, mention the details of the conditions that are not adhered to and further steps to be taken.			
13.	Can 'works completion' certificate be issued to this site?			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Officer of the CSC with date	

Note: The Environmental Officer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for the redevelopment of each Labour Camp Site as and when it is closed. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor . CSC has to attach this format to the Quarterly Report to be submitted to PMT, with details of corrective action taken by the Contractor .

Annexure 3. 27. Checklist for Monitoring of Redevelopment of Quarry and Stone Crusher Site

A	**Project Details**	Date of Monitoring:		
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
5.	Name of Quarry & Crusher with sl. no. in register of sites			
B	**Monitoring Details**			
Sl. No.	**Environmental Management Measures**	**CSC's observation (Yes / No / Not Applicable)**	**Corrective Actions Proposed**	**Remarks**
1.	Are all the temporary structures cleared as per the list in the redevelopment plan?			
2.	Are all debris, garbage, night soils and POL waste disposed off safely?			
3.	Are the facilities that could be put to re-use maintained well ?			
4.	Has the conserved top soil been reused ?			
5.	Are the improvement measures identified in the redevelopment plan implemented ?			

6.	If not, mention the measures yet to be implemented.			
7.	Has the residual top soil been utilized effectively?			
8.	Has the entire area been made clean and tidy without disturbing the adjacent lands?			
9.	Are the plantations / green belt along the boundary of the camp maintained well ?			
10.	Has additional tree plantation been undertaken as mentioned in the re-development plan ?			
11	Has erosion control measures and slope stabilization measures been undertaken ?			
12.	Whether pits created by blasting are filled with overburden soil.			
13.	Has the local community been involved in the implementation of redevelopment plan ?			
14.	Are the required photographs submitted to CSC?			
15.	Are the conditions mentioned by the owner in the agreement adhered to ?			
16.	If not, mention the details of the conditions that are not adhered to and further steps to be taken.			

17.	Can 'works completion' certificate be issued to this site ?			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Officer of the CSC with date	

Note: The Environmental Officer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for the redevelopment of each Quarry and Crusher Site as and when it is closed. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor . CSC has to attach this format to the Quarterly Report to be submitted to PMT, with details of corrective action taken by the Contractor .

Annexure 3. 28. Checklist for Monitoring of Redevelopment of Borrow Areas

A	**Project Details**	**Date of Monitoring:**		
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
5.	Name of Borrow Area with sl. no. in register of sites			
B	**Monitoring Details**			
Sl. No.	**Environmental Management Measures**	**CSC's observation (Yes / No / Not Applicable)**	**Corrective Actions Proposed**	**Remarks**
1.	Has slope stabilization been undertaken along the edges (if there is a level difference) ?			
2.	Is all the waste material raised from the borrow area disposed off properly ?			
3.	Has the preserved top soil been used in redevelopment of site ?			
4.	Has the borrow areas been re-vegetated properly ?			

5.	Is the cross drainage system and the flood water drains managed properly to avoid occurrence of flooding ?			
6.	Are the borrow area pits re-developed ?			
7.	Is the leveling of depression after filling-in of wastes undertaken?			
8.	Selection of Species as per OSRP Project Guidelines for plantation.			
9.	Has bund creation and temporary fencing been undertaken?			
10.	Ponds including creation of new ones and enhancing capacity of existing ones (for irrigation; pissiculture and general uses by people and/or cattle)			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Officer of the CSC with date	

Note: The Environmental Officer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for the redevelopment of each Borrow Area as and when it is closed. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor . CSC has to attach this format to the Quarterly Report to be submitted to PMT, with details of corrective action taken by the Contractor .

Annexure 3. 29. Checklist for Monitoring of Redevelopment of Debris Disposal Site

A	**Project Details**	**Date of Monitoring:**		
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
5.	Name of Debris Disposal Site with sl. no. in register of sites			
B	**Monitoring Details**			
Sl. No.	**Environmental Management Measures**	**CSC's observation (Yes / No / Not Applicable)**	**Corrective Actions Proposed**	**Remarks**
1.	Whether preserved top soil is reused or not?			
2.	Rehabilitation of the dump site by planting local shrubs and other plant species.			
3.	Conversion of debris site into farm land, playground, parking area, block plantation area etc.			

4.	Maintenance of the hydrological flow in the area.			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Officer of the CSC with date	

Note: The Environmental Officer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for the redevelopment of each Debris Disposal Site as and when it is closed. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor . CSC has to attach this format to the Quarterly Report to be submitted to PMT, with details of corrective action taken by the Contractor .

Annexure 3. 30. Reporting Format for Work Force Management

A	**Project Details**	**Date of Reporting:**			
1.	Name of project stretch and link no.				
2.	Name and address of the Contractor				
3.	Contract date and duration				
4.	Status of completion of the project				
5.	Name of Work Site with sl. no. in register of sites				
B.	**Status of work force**				
SI. No.	**Category of work force**	**Work force in the Previous Month (No.)**	**Work force added in the reporting month (No.)**	**Work Force left in the reporting month (No.)**	**Total work force in the reporting month (No.)**
1.	Unskilled Labourers				
2.	Skilled labourers				
3.	Supervisors				
4.	Engineers				

5.	Office Staff				
	Sub Total				
	Grand Total				

C.	**Categorization of work force**										
SI. No.	**Category of work force**	**Male**		**Female**		**Employment Status**		**Residential Status**		**Accommodation Status**	
		< 18 yrs.	**> 18 yrs.**	**< 18 yrs.**	**> 18 yrs.**	**Regular**	**Temporary**	**Migrant**	**Local**	**Staying in Labour Camp / Quarters**	**Others**
1.	Unskilled Labourers										
2.	Skilled labourers										
3.	Supervisors										
4.	Engineers										
5.	Office Staff										
	Sub Total										
	Grand Total										

D.	**Details of non-working migrated people, living in the Labour Camps / Staff Quarters as part of work force family**								
No. of children (0-6 yrs.)			**No. of children (7-18 yrs.)**			**No. of adults**			**Grand Total**
Male	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	

C.	**Submission Details**	
	Submitted by **(Environmental & Safety Engineer of Contractor)**	**Approved by** **(Environmental Officer of CSC)**
Signature & date		
Name		
Designation		
Remarks by CSC		

Note: Contractor has to fill and submit this format to the CSC along with the Monthly Report. In addition to that, the Contractor has to maintain the database of work force in the form of a register. An attendance register for the work force should also be maintained by the Contractor . Contractor has to report the details of migrant work force to the nearest police station. The CSC has to visit the sites and verify the details. The EO of CSC has to give back a copy of this format to the Contractor after his approval with remarks.

Annexure 3. 31. Reporting Format for Occupational Health and Safety Measures

A	Project Details	Date of Reporting:	
1.	Name of project stretch and link no.		
2.	Name and address of the Contractor		
3.	Contract date and duration		
4.	Status of completion of the project		
B	**Implementation Status of Health and Safety Measures**		
Sl. No.	**Health and Safety Measures**	**Implementation Status (Yes / No)**	**Remarks**
1	Appointment of qualified Environment and Safety Engineer		
2	Approval for Construction Safety Management Plan by the Engineer.		
3	Provision for flags and warning lights for potential hazards		
4	Provision of adequate staging, form work and access (ladders with handrail) for works at a height of more than 3.0 m		
5	Provision of adequate shoring / bracing / barricading / lighting for all deep excavations of more than 3.0 m depth.		

6	Provision for sufficient lighting especially for night time work		
7	Construction Workers safety - Provision of personnel protective equipments		
	A. Helmets		
	B. Safety Shoe		
	C. Dust masks		
	D. Hand Gloves		
	E. Safety Belts		
	F. Reflective Jackets		
	G. Earplugs for labour		
8	Workers engaged in welding work shall be provided with welder protective shields		
9	All vehicles are provided with reverse horns.		
10	All scaffolds, ladders and other safety devices shall be maintained in as safe and sound condition		
11	Regular health checkup for labour/ Contractor 's personnel		
12	Ensuring the sanitary conditions and all waste disposal procedures & methods in the camps.		

13	Provision for insurance coverage to the workers		
C.	**Submission Details**		

	Submitted by **(Environment & Safety Engineer of Contractor)**	**Approved by** **(Environmental Officer of CSC)**
Signature & date		
Name		
Designation		

Remarks by CSC

Note: Contractor has to fill and submit this format to the CSC along with the Monthly Report. The CSC has to visit the sites and verify the details. Further mitigation measures, if required, can be suggested by the CSC. The EO of CSC has to give back a copy of this format to the Contractor after his approval with remarks.

Annexure 3. 32. Reporting Format for Water Sprinkling for Dust Suppression

A	Project Details	Month and Year of reporting:
1.	Name of project stretch and link no.	
2.	Name and address of the Contractor	
3.	Contract date and duration	
4.	Status of completion of the project	
5.	Location of water sprinkling	
B	**Water Sprinkling Details**	

Particulars	Days																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
No. of trips per day																															
Quantity of Water Sprinkled (KLD)																															
If not sprinkled, reason for the same																															

C.	Submission Details	
	Submitted by **(Environment & Safety Engineer of Contractor)**	**Approved by** **(Environmental Officer of CSC)**
Signature & date		
Name		
Designation		
Remarks by CSC		

Note: Contractor has to fill this format for each construction site (preferably in A3 size paper) and submit to the CSC along with the Monthly Report. The CSC has to visit the sites and verify the details. Additional water sprinkling, if required, can be suggested by the CSC. The EO of CSC has to give back a copy of this format to the Contractor after his approval with remarks.

Annexure 3. 33. Reporting Format for Road Safety Measures During Construction

A	Project Details	Date of Reporting:	
1.	Name of project stretch and link no.		
2.	Name and address of the Contractor		
3.	Contract date and duration		
4.	Status of completion of the project		
B	**Details of Safety Measures**		
S.No	**Safety Measures**	**Compliance Status (Yes / No)**	**Remarks**
a.	**General**		
1	A qualified Environment and Safety Engineer should be appointed		
2	A Traffic Management Plan should be prepared in accordance with IRC: SP: 55-2001 and got approved by the Engineer		
3	Maintenance of existing road stretches handed over to the Contractor should be carried out		
b.	**Details of Construction Zone**		
1	Length of transition sub zone should be min 50 m for a speed of 50km/hr		
2	Length of work sub zone in urban stretch should be<2 km		
3	Length of work sub zone in rural stretch should be 5-10 km		

c.	**Signages in construction zones**		
1	Sign saying 'Men at Work' should be kept 1 km ahead of Transition sub zone		
2	Supplementary sign saying Diversion 1 km should be provided		
3	Sign saying 'Road Closed ahead' should be provided		
4	Compulsory Tum Right/Left sign should be provided		
5	Detour sign should be placed		
6	Sharp Deviation sign should be placed at end of advance warning sub zone		
7	Signage should be provided in Transition Sub Work Zone		
8	Signage saying 'Keep Right/Left should be provided		
9	Signage should be placed in work sub zone		
10	Hazard Marker should be placed where railing for CD structure on diversion starts		
11	Barricade should be provided on either side of work sub zone		
12	Flag persons should be provided for traffic control		
13	Flags and warning lights should be provided at Construction zones		
14	Metal drum /empty bitumen drum delineator, painted in circumferential strips of alternate black and white		

	100mm wide 2 coats fitted with reflectors 3 Nos of 7.5cm diameter or Barricades/caution tapes should be provided in construction zones		
15	Plastic crash barriers should be provided		
16	Demarcations (fencing, guarding and watching) should be provided at bridge / culvert construction sites		
17	Arrangements should be made for controlled access and entry to Construction zones		
18	Regular Inspection of Work Zone Traffic Control Devices should be carried out by authorized Contractor personnel		
19	All vehicles should be provided with reverse horns		
20	Speed of construction vehicles should be controlled through road safety training of drivers		
d.	**Signage in Termination sub zone**		
1	Sign for indication of end of work zone should be placed 120m from end of termination sub zone		
e.	**Road Delineators**		
1	Roadway indicators should be provided		
2	Hazard markers should be provided		
3	Object markers should be provided		

C.	Submission Details	
	Submitted by **(Environment & Safety Engineer of Contractor)**	**Approved by** **(Environmental Officer of CSC)**
Signature & date		
Name		
Designation		
Remarks by CSC		

Note: Contractor has to fill this format and submit to the CSC along with the Monthly Report. The CSC has to visit the sites and verify the details. Additional safety measures, if required, can be suggested by the CSC. The EO of CSC has to give back a copy of this format to the Contractor after his approval with remarks.

Annexure 3. 34. Format for Register of Accidents and it's Reporting

A	**Project Details**		**Date of Reporting:**	
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
B	**Details of Accident and People Involved in Accident**			
	Name of site where accident happened			
	Name and address of people involved in the accident			
	Whether Contractor 's personnel or General public			
	Details of Injury			
	Details of treatment given			
	Details of compensation given			
C	**Type of Accident (√)**			
	Fall of person from a height			Explosion
	Slip, trip or fall on same level			Fire
	Struck against fixed objects			Contact with hot or corrosive substance
	Struck by flying or falling objects			Contact with poisonous gas or toxic substances.
	Struck by moving objects			Contact with poisonous gas or toxic substances
	Struck / caught by cable			Hand tool accident
	Stepping on hail etc.			Vehicle / Mobile plant accident
	Handling without machinery			Machinery operation accident
	Crushing / burying			Other (please specify)
	Drowning or asphyxiation			
D	**Agent Involved in Accident (√)**			

	Machinery			Stair edge
	Portable power appliance			Excavation / underground working
	Vehicle or associated equipment /machinery			Ladder
	Material being handled, used or stored			Scaffolding /gondola
	Gas, vapor, dust, fume or oxygen			Construction formwork, shuttering and false work.
	Hand tools			Electricity supply cable, wiring switchboard and associated equipment
	Floor edge			Nail, sllnter or chipping
	Floor opening			Other (Please specify)
	Left shaft			
E	**Unsafe Action Relevant to the Accident (√)**			
	Operating without authority			Failure to use proper footwear
	Failure to secure objects			Failure to use eye protector
	Making safety devices inoperative			Failure to use respirator
	Working on moving or dangerous equipment			Failure to use proper clothing
	Using un-safety equipment			Failure to use warn others or given proper signals
	Adopting unsafe position or posture			Horseplay
	Operating or working at unsafe speed			No unsafe action
	Unsafe loading, Placing, mixing et			Others (please specify)
	Failure to use helmet			
F	**Lack of Safety Measures Relevant to the Accident (√)**			
	No protective gear			Unsafe layout of job, traffic etc.
	Defective protective gear			Unsafe process of job methods
	Improper dress / footwear			Poor housekeeping
	Improper guarding			Lack of warning system
	Improper ventilation			Defective tool, machinery or materials
	Improper illumination			No unsafe condition
	Improper procedure			Others (please specify)
G	**Personal Factor Relevant to the Accident (√)**			

	Incorrect attitude /motive			No unsafe personal factor.
	Unsafe act by another person			Other (please specify)

H	**Details of Corrective and Preventive action taken**
1	
2	
3	
4	
I	**Submission Details**

	Submitted by **(Environment & Safety Engineer of Contractor)**	**Approved by** **(Environmental Officer of CSC)**
Signature & date		
Name		
Designation		

Remarks by CSC

Note: Contractor has to fill this format as and when an accident happens and submit to the CSC along with the Monthly Report. The CSC has to visit the sites and verify the details. Additional safety measures, if required, can be suggested by the CSC. The EO of CSC has to give back a copy of this format to the Contractor after his approval with remarks.

Annexure 3. 35. Reporting Format for Environmental Pollution Monitoring

A	**Project Details**	**Date of Reporting:**				
1.	Name of project stretch and link no.					
2.	Name and address of the Contractor					
3.	Contract date and duration					
4.	Status of completion of the project					
B	**Environmental Monitoring Details**					
SI. No	**Details of Monitoring Location**	**Period of Monitoring**	**Details of values exceeding the relevant standards**	**Reasons for pollution**	**Details of Corrective actions taken**	**Remarks**
a.	**Air Monitoring**					
1.						
2.						
3.						

b.	**Water Monitoring**					
1.						
2.						
3.						
c.	**Noise Monitoring***					
1.						
2.						
3.						

C	Submission Details	
	Submitted by **(Environment & Safety Engineer of Contractor)**	**Approved by** **(Environmental Officer of CSC)**
Signature & date		
Name		
Designation		
Remarks by CSC		

** Noise monitoring along the road will be done by the CSC, using the Noise Meter of PMT. The CSC has to give the monitoring results to the Contractor for corrective actions, if any, required and including in this report.*

Note: The Contractor has to conduct Environmental Monitoring through a NABL approved Laboratory as per the Environmental Monitoring Plan given in the EMP, fill this format and submit to the CSC along with the Monthly Report, if monitoring was due in that month. A copy of the monitoring report given by the Laboratory has to be attached to this format. The CSC has to visit the sites and verify the details. Additional mitigation measures, if required, can be suggested by the CSC. The EO of CSC has to give back a copy of this format to the Contractor after his approval with remarks.

Annexure 3. 36. Reporting Format for Enhancement and Mitigation of Common Property Resources

A	**Project Details**		**Date of reporting:**
1.	Name of project stretch and link no.		
2.	Name and address of the Contractor		
3.	Contract date and duration		
4.	Status of completion of the project		
B	**Details of Enhancement Measures**		
Sl. No.	**Location with chainage**	**% work completed**	**Remarks and reasons for delay, if any.**
a	**Raising embankment height**		
b	**Public water sources**		
c	**Bus stops and bus bays**		

d	**Water bodies**		
e	**Auto / Jeep / Taxi stands**		
f	**Sign Boards**		
g	**Oxbow land (Type C) development**		
h	**Cultural Properties**		

i	**Any other measures**		
C	**Submission Details**		

	Submitted by (Environment & Safety Engineer of Contractor)	**Approved by (Environmental Officer of CSC)**
Signature & date		
Name		
Designation		
Remarks by CSC		

Note: The Contractor has to fill the details of enhancement measures carried out for amenities / facilities other than cultural properties during the reporting month in this format and submit to the CSC along with the Monthly Report. Overall progress in this activity for the entire project road is to be included in the Monthly Report. The CSC has to visit the sites and verify the details. Additional mitigation measures, if required, can be suggested by the CSC. The EO of CSC has to give back a copy of this format to the Contractor after his approval with remarks.

Annexure 3. 37. Reporting Format for Tree Plantation

A	**Project Details**		**Date of reporting:**	
1.	Name of project stretch and link no.			
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
B	**Details of Trees Planted**			
Sl. No.	**Location with chainage**	**No. of Trees to be Planted**	**% work completed**	**Remarks and reasons for delay, if any**
C	**Submission Details**			

	Submitted by **(Environment & Safety Engineer of Contractor)**	**Approved by** **(Environmental Officer of CSC)**
Signature & date		
Name		
Designation		

Remarks by CSC

Note: The Contractor has to fill the details of Trees planted during the reporting month in this format and submit to the CSC along with the Monthly Report. Overall progress in this activity for the entire project road is to be included in the Monthly Report. The CSC has to visit the sites and verify the details. The EO of CSC has to give back a copy of this format to the Contractor after his approval with remarks.

Annexure 3. 38. Reporting Format for Monthly Report from Contractor to Construction Supervision Consultant

A	**Project Details**	**Period of Reporting:**
1.	Name of project stretch and link no.	
2.	Name and address of the Contractor	
3.	Contract date and duration	
4.	Status of completion of the project	

B.	**Physical Progress Report**								
Sl. No.	**Enhancement Measure**	**Physical target (Nos.)**	**Units carried over from previous month**	**Units started in reporting month**	**Units completed in reporting month**	**Units carried over to next month**	**Cumulative units completed till end of reporting month**	**% target completed**	**Remarks / reasons for delay**
			(a)	(b)	(c)	(d=a+b-c)			
1.	Noise barrier								

2.	Hand pumps								
3.	Bus Shelter								
4.	Sign Boards								
5.	Preserving and landscaping cultural properties like shrines / hyundi								
Sl. No.	**Enhancement Measure**	**Physical target (Nos.)**	**Units carried over from previous month**	**Units started in reporting month**	**Units completed in reporting month**	**Units carried over to next month**	**Cumulative units completed till end of reporting month**	**% target completed**	**Remarks / reasons for delay**
			(a)	(b)	(c)	(d=a+b-c)			
6.	Constructing new well								
7.	providing new water taps								
8.	Parking space for								

	auto rickshaws, cars and jeep								
9.	Landscaping of type C oxbow lands								
10.	Planting trees along road side								
11.	Planting trees on inner side of sound insulating wall								
12.	Providing 1.2 mt. high fencing under via duct								
13.	Concrete flooring with slope drains and oil interceptors in construction camps								
C.	**Details of Sites for Project Ancillary facilities**								

Sl. No.	Type of camp / site	Cumulative No of sites opened	No of sites operational	Cumulative No of sites redeveloped	Cumulative No of sites closed*	Remarks
1.	Construction camp					
2.	Labour camp					
3.	Quarry & stone crusher unit					
4.	Borrow Area					
5.	Debris disposal site					
6.	Water sources			NA		

** A site will be considered closed after redeveloping and obtaining closure certificate from CSC.*

D. Summary of machinery and equipment available

SI. No.	Type of equipment / machinery / vehicles	Nos. available	Validity date of PUC certificate (as applicable)	Remarks
1.				

E.	**Details of lapses and notices**					
Sl. No.	**Details of notices issued by CSC**	**Date of notice**	**Type of lapse (Major / Minor)**	**Notice No. ***	**Corrective actions taken**	**Remarks**

**In case of minor lapse, specify whether original notice, first reminder or second reminder.*

F.	**REPORTING FORMATS TO BE ANNEXED WITH THIS MONTHLY REPORT BY THE CONTRACTOR**				
SL. NO	**REPORTING FORMAT**	**YES/NO**	**SL. NO**	**REPORTING FORMAT**	**YES/NO**

.					
1	Format for Register of sites opened and closed and its reporting		8	Reporting Format for Register of Accidents and it's Reporting	
2	Format for Register of complaints and its reporting		9	Reporting Format for Enhancement and Mitigation of Cultural Properties	
3	Reporting Format for Work Force Management		10	Reporting Format for Noise Barrier Construction	
4	Reporting Format for Occupational Health and Safety Measures		11	Reporting Format for Enhancement Measures Other than Cultural Properties	
5	Reporting Format for Top Soil Conservation		12	Reporting Format for Tree Plantation	
6	Reporting Format for Water Sprinkling for Dust Suppression		13	Reporting Format for Environmental Quality Monitoring	
7	Reporting Format for Road Safety Measures During Construction		-	-	-

G. SUBMISSION DETAILS	**SUBMITTED BY (ENVIRONMENT & SAFETY ENGINEER OF CONTRACTOR)**	**APPROVED BY (ENVIRONMENTAL OFFICER OF CSC)**
Signature & date		
Name		
Designation		
Remarks by CSC		

Annexure 3. 39. Reporting Format for Monthly Report from CSC to PMT

A	**Project Details**								
1.	Name of project stretch and link no.								
2.	Name and address of the Contractor								
3.	Contract date and duration								
4.	Status of completion of the project								
B.	**Physical Progress Report**								
Sl. No.	**Enhancement Measure**	**Physical target (Nos.)**	**Units carried over from previous month**	**Units started in reporting month**	**Units completed in reporting month**	**Units carried over to next month**	**Cumulative units completed till end of reporting month**	**% target completed**	**Remarks / reasons for delay**
			(a)	(b)	(c)	(d=a+b-c)			
1.	Noise barrier								
2.	Hand pumps								
3.	Bus Shelter								
4.	Sign Boards								

Sl. No.	Enhancement Measure	Physical target (Nos.)	Units carried over from previous month	Units started in reporting month	Units completed in reporting month	Units carried over to next month	Cumulative units completed till end of reporting month	% target completed	Remarks / reasons for delay
			(a)	(b)	(c)	(d=a+b-c)			
5.	Preserving and landscaping the cultural properties like shrines and hyundi								
6.	Constructing new well								
7.	providing new water taps								
8.	Parking space for auto rickshaws, cars and jeep								
9.	Landscaping of type C oxbow lands								
10.	Planting trees along road side								

11.	Planting trees on inner side of sound insulating wall								
12.	Providing 1.2 mt. high fencing under via duct								
13.	Concrete flooring with slope drains and oil interceptors								

C.	**Details of Sites for Project Ancillary facilities**					
SI. No.	**Type of camp / site**	**Cumulative No of sites opened**	**No of sites operational**	**Cumulative No of sites redeveloped**	**Cumulative No of sites closed***	**Remarks**
1.	Construction camp					
2.	Labour camp					
3.	Quarry & stone crusher unit					
4.	Borrow Area					
5.	Debris disposal site					
6.	Water sources			NA		
** A site will be considered closed after redeveloping and obtaining closure certificate from CSC.*						
D.	**Summary of machinery and equipment available**					

SI. No.	Type of equipment / machinery / vehicles	Nos. available	Validity date of PUC certificate (as applicable)	Remarks
1.				

E.	Details of lapses for which notices were issued during the previous reporting month					
Sl. No.	**Details of notices issued by CSC**	**Date of notice**	**Type of lapse (Major / Minor)**	**Notice No. ***	**Corrective actions taken by Contractor**	**Remarks**

**In case of minor lapse, specify whether original notice, first reminder or second reminder.*

F.	**Details of major lapses for which notices were issued during the current reporting month**			
SI. No.	**List of major lapses**	**Date of issuing notice**	**Whether invoking penalty clause from next interim payment certificate is recommended?**	**Remarks**
1.				
2.				
3.				
4.				

G.	**Details of minor lapses for which notices were issued during the current reporting month**					
SI. No.	**List of minor lapses**	**Date of issuing notice**			**Whether invoking penalty clause from next interim payment certificate is recommended?**	**Remarks**
		Original notice	**First Reminder**	**Second Reminder**		
2.						
3.						

4.						
5.						
6						
7						
8						

H	**Reporting / Monitoring formats to be annexed with this monthly report by the CSC**				
Sl. No.	**Reporting / Monitoring format**	**Yes/No**	**Sl. No**	**Reporting / Monitoring format**	**Yes/No**
1	Format for Register of sites opened and closed and its reporting		13	Reporting Format for Environmental Quality Monitoring	
2	Format for Register of complaints and its reporting		14	Checklist For Monitoring Of Construction Camp Management	
3	Reporting Format for Work Force Management		15	Checklist For Monitoring Of Labour Camp Management	
4	Reporting Format for Occupational Health and Safety Measures		16	Checklist For Monitoring Of Quarry And Stone Crusher Management	
5	Reporting Format for Top Soil Conservation		17	Checklist For Monitoring Of Borrow Area Management	
6	Reporting Format for Water Sprinkling for Dust Suppression		18	Checklist For The Monitoring Of Debris Disposal Site Management	
7	Reporting Format for Road Safety Measures During Construction		19	Check List For Monitoring Of Redevelopment Of Construction Camp Site	-
8	Reporting Format for Register of Accidents and it's Reporting		20	Check List For Monitoring Of	

				Redevelopment Of Labour Camp Site	
9	Reporting Format for Enhancement and Mitigation of Cultural Properties		21	Check List For Monitoring Of Redevelopment Of Quarry And Stone Crusher Site	
10	Reporting Format for Noise Barrier Construction		22	Check List For Monitoring Of Redevelopment Of Borrow Areas	
11	Reporting Format for Enhancement Measures Other than Cultural Properties		23	Check List For Monitoring Of Redevelopment Of Debris Disposal Site	
12	Reporting Format for Tree Plantation				

I Submission Details	**Submitted by** **(Environmental Officer of CSC)**	**Approved by** **(Environmental Engineer of PMT)**
Signature & date		
Name		
Designation		
Remarks by PMT		

Annexure 3. 40. List of Permission to be Obtained by the Contractor

Sl. No	Type of Clearance	Statutory Authority	Applicability	Project Stage	Responsibility
1	Consent to Establish under the Air (Prevention & Control of Pollution) Act, 1981 and The Water (Prevention & Control of Pollution) Act, 1974.	Kerala State Pollution Control Board	For operating hot mix plants, crushers and construction camps	Construction (Prior to work initiation)	Contractor
2	Consent to Operate under the Air (Prevention & Control of Pollution) Act, 1981 and The Water (Prevention & Control of Pollution) Act, 1974.	Kerala State Pollution Control Board	For operating hot mix plants, crushers and construction camps	Construction (Prior to work initiation)	Contractor
3	Permission to store Hazardous Materials under Hazardous Waste (Management and Handling) Act 1989	Kerala State Pollution Control Board	Storage and Transportation of Hazardous Materials and Explosives	Construction (Prior to work initiation)	Contractor
4	Explosive license under The Explosives Act (& Rules), 1884 (revised in 1983)	Chief Controller of Explosives, petroleum & Explosive Safety Organization	Storage of explosive materials	Construction (Prior to work initiation)	Contractor
5	PUC certificate for vehicles for construction under Central Motor and Vehicle Act 1988	Motor Vehicle Department of Kerala	For all construction vehicles	Construction (Prior to work initiation)	Contractor
6	Quarry lease deeds and license under The Mines Act, 1958 *	Mining and Geology Department of Kerala	Quarrying and borrowing operations	Construction (Prior to work initiation)	Contractor
7	Consent for ground water extraction	Kerala Ground Water Authority	Ground water extraction for construction camps	Construction (Prior to work initiation)	Contractor
8	Consent for establishment of labour camp	Labour depsrtment of Kerala	Labour camps	Construction (Prior to work initiation)	Contractor
9	Consent to establish borrow area*	Local Panchayth / Municipality	Borrow area	Construction (Prior to work initiation)	Contractor

Sl. No	Type of Clearance	Statutory Authority	Applicability	Project Stage	Responsibility
10	Consent to Operate under the Air (Prevention & Control of Pollution) Act, 1981	Kerala State Pollution Control Board	For establishing Hot mix plants, Crushers, construction camps and batching plants	Operation	Contractor
11	Consent to Operate under the Water (Prevention & Control of Pollution) Act, 1974	Kerala State Pollution Control Board	For discharging of domestic waste water through soak pit	Operation	Contractor
* In the case of quarry, burrow areas and sand mining sites, if the Contractor is not owing the sites, the Contractor has to ensure that the material is obtained from approved sites as per MoEF guidelines dated 18th May, 2012.					

Annexure 3. 41. Proposed Chainages of Retaining Wall Location where Embankment Height will be Raised

Sl. No.	Chainage (km)		Length (m)
	From	To	
1	89+750	90+500	750
2	90+500	91+600	1100
3	100+900	101+000	100
4	106+900	107+200	300
5	107+800	108+050	250
6	120+600	122+550	1950
7	122+550	123+400	850
8	128+600	129+000	400
9	129+600	130+250	650

Annexure 3. 42. List of Affected Public Water Sources along Ponkunnam – Thodupuzha Road

Chainage	Water Source	Left/Right
81.290	Public water tap	Right
81.760	Public water tap	Right
81.970	Public water tap	Left
82.110	Public water tap	Left
82.190	Public water tap	Left
82.850	Public water tap	Left
84.120	Public water tap	Right
84.930	Public open well	Right
84.960	Public water tap	Left
85.940	Public water tap	Right
86.980	Public water tap	Right
89.020	Public open well	Left
89.060	Public water tap	Left
96.440	Public water tap	Right
96.790	Public water tap	Right
99.270	Bore well	Left
100.81	Public open well	Right
103.61	Public water tap	Right
104.390	Public water tap	Right
107.410	Public water tap	Left
112.140	Bore well	Left
112.610	Public water tap	Left
113.920	Bore well	Right
114.620	Bore well	Right

Chainage	Water Source	Left/Right
117.990	Bore well	Right
122.790	Public water tap	Left
123.350	Public water tap	Left
123.930	Public water tap	Left
124.080	Public water tap	Left
124.200	Public water tap	Left
124.970	Public water tap	Left
125.100	Bore well	Left
125.540	Public water tap	Right
125.740	Public water tap	Right
126.010	Public water tap	Right
126.150	Public water tap	Right
126.660	Public water tap	Left
126.950	Public water tap	Right
127.070	Public water tap	Left
128.060	Public water tap	Right
128.810	Public water tap	Left
129.500	Public water tap	Left
129.810	Public water tap	Left
130.730	Public water tap	Left
131.270	Public water tap	Left
131.720	Public water tap	Left
131.960	Public water tap	Right
132.140	Public water tap	Right

Annexure 3. 43. Details Proposed Bus Stops and Bus Bays Locations

Sl. No.	Chainage (km)	Side
1	85+210	LHS
2	85+220	RHS
3	85+840	LHS
4	85+840	RHS
5	86+780	LHS
6	86+880	RHS
7	87+380	RHS
8	87+460	LHS
9	87+900	LHS
10	87+900	RHS
11	88+480	RHS
12	88+920	LHS
13	89+410	LHS
14	92+880	LHS
15	93+660	LHS
16	93+660	RHS
17	94+300	LHS
18	94+300	RHS
19	96+820	LHS
20	96+820	RHS

Sl. No.	Chainage (km)	Side
21	97+600	RHS
22	97+700	LHS
23	103+150	LHS
24	103+150	RHS
25	111+990	RHS
26	114+420	LHS
27	115+800	RHS
28	115+900	LHS
29	118+470	LHS
30	118+470	RHS
31	119+120	LHS
32	119+140	RHS
33	120+520	LHS
34	120+520	RHS
35	122+590	LHS
36	122+590	RHS
37	126+540	LHS
38	126+540	RHS
39	128+590	LHS
40	128+590	RHS

Annexure 3. 44. Sensitive Noise Receptors along Link 84

S.No	Chainage(km)	Side	Location
1	84+645	LHS	School
2	88+330	LHS	School
3	88+670	LHS	School
4	89+485	LHS	School
5	89+485	RHS	School
6	93+285	LHS	School
7	94+040	LHS	School
8	96+090	RHS	School
9	96+210	RHS	School
10	98+610	LHS	Hospital
11	106+290	RHS	School

S.No	Chainage(km)	Side	Location
12	108+770	LHS	School
13	110+860	RHS	Hospital
14	111+890	RHS	School
15	114+300	RHS	School
16	118+340	LHS	School
17	124+780	LHS	School
18	125+450	LHS	School
19	130+080	RHS	School
20	131+035	RHS	School
21	131+210	LHS	School
22	132+185	RHS	School

Annexure 3. 45. Most Likely Flood Prone Sections along Link 84

Location	Chainage		Length (M)	Mitigation Measures
	From	To		
Parathanam	124.000	124.500	500	Suitably raised the embankment, improved cross drainage and longitudinal cross drainage

Annexure 3. 46. Water Bodies along Link 84, Impact, Mitigation and Enhancement

Location	Chainage	Width/Approximate Surface Area	Right/ Left	Nature Of Water Body	Enhancement Action
Koorali	90.550-91.630	1080m long	Right & crosses	Stream	Stone pitching and visual integration
Madukkankunnu	93.030-93.800	770m long	Right	Stream	Stone pitching and visual integration
Poovarani	98.040	5m	Crossing	Stream	Stone pitching and visual integration
Vilakkumaruthu	100.600-101.350	750m long	Left	Stream	Stone pitching and visual integration
Kuttilam	101.700-102.320	620m long	Left	Stream	Stone pitching and visual integration
Kadayam	102.460-102.680	220m long	Left	Stream	Stone pitching and visual integration
Kadayam	102.760-103.200	440m long	Left	Stream	Stone pitching and visual integration
Pala	104.950	110m	Crossing	Meenachil River	Stone pitching, information board and visual integration
Pravithanam	110.240	430 m2	Left	Pond	Wall and steps
Kollapally	113.350	30m	Crossing	River	Stone pitching and visual integration
Pizhaku	117.530	30m	Crossing	Stream	Stone pitching and visual integration
Parathanam	124.300-125.000	700m long	Left	Stream	Stone pitching and visual integration
Karinkunnam	127.500-128.080	580m long	Right	Stream	Stone pitching and visual integration
Karinkunnam	128.900-129.640	740m long	Right	Stream	Stone pitching and visual integration
Nadukandam	130.300-130.550	250m long	Right crosses to left	Canal	Stone pitching and visual integration

Annexure 3. 47. Quarry and Borrow Areas near Link 84

Borrow area for Embankment/Subgrade Material: On reviewing the previous reports, it is observed that approved borrow areas from local PWD for embankment/subgrade fill material is not available, however soil for embankment/subgrade are available from private sources within 5 km distance along the project road.

Table 1: Details of Borrow Areas

Sl No	Location	District	Quantity Available
1	4 km from Manimala junction towards Changanaserry	Kottayam	11,65,491
2	7 km from Ponkunnam towards Punalur	Kottayam	25,000
3	2 km from Ranni junction towards Ponkunnam	Kottayam	20,234
4	12 km from Pala towards Thodupuzha	Ernakulam/ Kottayam	28,000
5	5.9 km from Thodupuzha	Ernakulam/ Kottayam	20,000
6	9.5 km from Ponkunnam	Kottayam	30,000
7	1 km from Pala junction towards Ramapuram	Kottayam	60,703
8	6.5 km from Pala junction towards Parathodu; 1 km towards Earattupetta	Ernakulam/ Kottayam	37,500

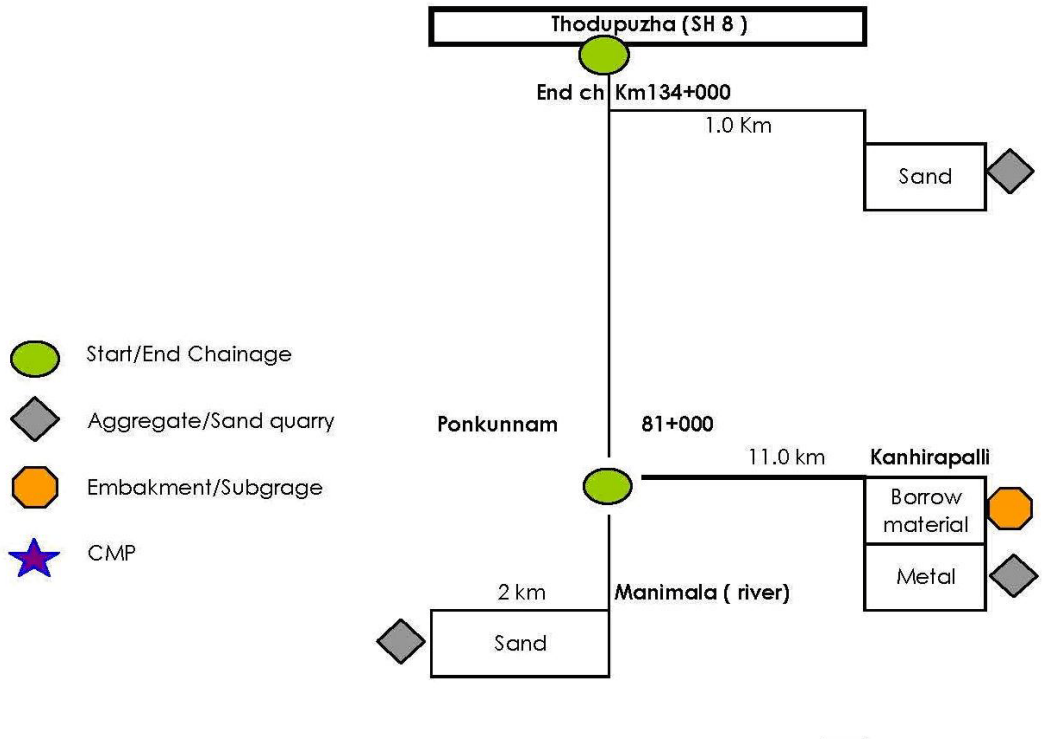
Metal Quarry for Coarse/Fine Aggregates- Available type of coarse aggregates in the vicinity of the project road is crushed rock from igneous rocks of granites or granitic type, which are generally well suited as materials for road construction. Summary of the metal quarry as reviewed from the earlier reports are as in Table 2 below-

Table 2: Details of Stone and Sand Quarries Areas

Quarry/ Material Source Name	Location/District	Production Capacity (M3 /Year)	Product Material
Kaniamuri Kadavu	Manimala / Kottayam	20,671	River sand
Koramannil Kadavu	Manimala / Pathanamthitta	14,470	River sand
Melanoor	Manimala / Kottayam	20,671	River sand
Muttoli Kadavu	Pala / Kottayam	20,671	River sand
Palat	Manimala / Kottayam	31,007	River sand
Sharus Crusher plant	Manimala / Kottayam	51,678	20 mm, 6 mm crushed stone and stone dust
Madapparam-bil Granites	Thodupuzha / Idukki	1,56,275	20mm, 6mm crushed stone and stone dust
ABYS Hollow Bricks	Paika junction / Kottayam	10,335	20mm, 6mm crushed stone and stone dust
Bismillah Crusher Metal	Pala / Kottayam	15,503	20mm, 6mm crushed stone and stone dust
Chembilavu Kadavu	Pala / Kottayam	10,336	River sand
Kinattukara Metal Crusher Unit	Paika / Idukki	1,29,195	40mm crushed stone
Kottakappalli	Pala / Kottayam	20,671	River sand
Maliakkal Crusher	Ponkunnam /	16,537	20mm, 6mm crushed stone and

	Kottayam		stone dust
Sixth mile kadavu	Pala / Kottayam	10,336	River sand
Thazhathupar-ambil crusher	Pala / Kottayam	49,611	20mm, 12.5mm, 6mm crushed stone and stone dust
Vattamattathil	Karinkunnam / Idukki	10,852	20mm, 12mm, 6mm crushed stone and stone dust
Near Thodupuzha	Idukki	9,757	River sand

Figure 1: Chart Showing Row Material Sources



Annexure 3. 48. Material Sources Available near Link 84

Cement, Bitumen and Steel- Cement, bitumen, and Steel are the manufactured materials. Cement and steel with IS certification are available from nearby locality. Bitumen is available from refineries at Mangalore in Karnataka, with an average lead of 395 km to the start of the project stretch. Bitumen is also available from Kochi refineries which are about 55 km from the end of the project area.

Annexure 3. 49. Details of Likely Tree Removal

Trees to be Felled in Punkonnum to Thodupuzha

Chainage (km)		Categorisation of tress based on GBH					
		< 0.3 m			0.3 - 0.6 m		
		LHS	RHS	Total	LHS	RHS	Total
84+000	85+000	5	1	6	0	0	0
85+000	86+000	9	9	18	0	0	0
86+000	87+000	9	9	18	0	0	0
87+000	88+000	7	1	8	0	0	0
88+000	89+000	3	2	5	0	0	0
89+000	90+000	1	2	3	0	0	0
90+000	91+000	0	1	1	0	0	0
91+000	92+000	0	0	0	0	2	2
92+000	93+000	0	0	0	1	2	3
93+000	94+000	0	0	0	0	4	4
94+000	95+000	0	0	0	3	2	5
95+000	96+000	0	0	0	7	2	9
96+000	97+000	0	0	0	0	4	4
97+000	98+000	0	0	0	0	2	2
98+000	99+000	0	0	0	2	1	3
99+000	100+000	0	0	0	2	1	3
100+000	101+000	0	0	0	14	3	17
101+000	102+000	0	0	0	3	0	3
102+000	103+000	0	0	0	4	9	13
103+000	104+000	0	0	0	10	1	11
104+000	105+000	0	0	0	2	1	3
105+000	106+000	0	0	0	0	0	0
106+000	107+000	0	0	0	7	2	9
107+000	108+000	0	0	0	2	2	4
108+000	109+000	0	0	0	2	2	4
109+000	110+000	0	0	0	2	3	5
110+000	111+000	0	0	0	3	2	5
111+000	112+000	0	0	0	0	0	0
112+000	113+000	0	0	0	4	4	8
113+000	114+000	0	0	0	3	1	4
114+000	115+000	0	0	0	7	4	11
115+000	116+000	0	0	0	5	2	7
116+000	117+000	0	0	0	6	1	7
117+000	118+000	0	0	0	5	5	10
118+000	119+000	0	0	0	5	3	8
119+000	120+000	0	0	0	0	3	3
120+000	121+000	0	0	0	4	5	9
121+000	122+000	0	0	0	3	1	4
122+000	123+000	0	0	0	3	0	3

Chainage (km)		Categorisation of tress based on GBH					
		< 0.3 m			0.3 - 0.6 m		
		LHS	RHS	Total	LHS	RHS	Total
123+000	124+000	0	0	0	0	4	4
124+000	125+000	0	0	0	1	0	1
125+000	126+000	0	0	0	0	1	1
126+000	127+000	0	0	0	7	9	16
127+000	128+000	0	0	0	6	3	9
128+000	129+000	0	0	0	1	10	11
129+000	130+000	0	0	0	0	8	8
130+000	131+000	0	0	0	1	1	2
131+000	132+000	0	0	0	0	0	0
132+000	133+000	0	0	0	0	0	0
133+000	134+000	0	0	0	0	0	0
134+000	135+000	0	0	0	0	0	0
Total		**34**	**25**	**53**	**125**	**110**	**235**
Grand Total							**288**

Annexure 3. 50. Landscaping, Tree Planting and Environmental Enhancement Plan

1. INTRODUCTION

In Kerala the pedestrian movements along the highways are very high but usually confined to village/ town and their movement is mostly from the house to the local market, schools, offices and back. Now the priority of Kerala should be to have wider safer roads with more attention to road safety.

The unique nature of Kerala The clear absence of distinct boundaries separating village /semi-urban and urban areas is of prime importance in this regard. This is due to the fact that the ribbon development along roads of Kerala is more or less complete. Actually this is different from the normal ribbon development because the development is not only along the roadsides (linear/ribbon) but also everywhere in the low land (coastal) and midland areas. In the highland this is not observed because of the luxurious vegetation and plantations.

Public owned trees unlike north Indian roads, very few trees exist on Kerala Roads. However along old roads, the numbers of large specimen trees is higher. These trees have been protected wherever possible with suitable changes in the design. Wherever such changes cannot be effected it may be necessary to remove them.

Private owned trees The number of private owned trees to be acquired outside the right of way will be high compared to the public trees within the right of way. The private trees that will be affected during widening and improvement will be subjected to compensation at the appropriate market rates. In addition to this the project will plant three trees for every tree removed as a compensatory tree planting measure irrespective of the size, species etc.

2. ADVERSE EFFECT OF AVENUE PLANTING IN KERALA

With 3000 mm average rainfall spread over 120-130 days of the year, trees along the roadside result in :-

- Tree brances obstruct direct vision of drivers and can cause accidents. Some trees with huge canopy can cause a serious saftey hazard to passangers due to falling of branches.
- The droppings from trees (leaves, flowers etc) which are seldom cleared from the surface of the roads will increase the damage to the wearing surface besides making the riding surface more slippery and cause accidents, especially when these materials decay.
- The pavement being wet for longer periods due to reduced rate of evaporation by sunlight.
- The growth of the tree roots will also damage the pavement.
- Trees obstruct sight distances as well as the view of the natural landscape (Scenic beauty) like valley areas with lush green paddy fields bordered by back waters /lakes /ponds/ or green denuded hills particularly at dawn and dusk. This has more relevance when tourism potential of the State is considered.

3. TREE REMOVAL FROM THE AVAILABLE CORRIDOR OF THE ROAD

The road widening under the Kerala State Transport Project (KSTP) will necessitate removal of large number of trees from the roadsides. The details of the tree removal from link 84 are described in the following Table 1.0. The details of the tree removal are described in the EIA

documents as well as in the Environmental Management Plans available for each corridor.

3.1 ROAD SIDE AVENUE PLANTATION

In the KSTP project corridors, there is no continuous avenue plantation. The trees within the available corridors are surveyed and tabulated in the respective management plans and summarised tree removal list for link 84 is presented in Table 1.0. The common tree species found along the KSTP II link roads are Banyan trees, Tamarind, Jamun, Vaaka, Mahagony and Mango trees.

The total number of trees to be removed from the road is estimated as 288 numbers for a length of 49.070 km. The tree removal is largely based on the road safety issues and partly due to the difficulties in the land acquisition process in Kerala.

TABLE 1.0. THE DETAILS OF LIKELY TREE REMOVAL ALONG THE CORRIDOR (LINK 84)

Sections	Trees Having < 0.3 m GBH	Trees Having 0.3 to 0.6 m GBH	Trees Having 0.6 to 0.9 m GBH	Trees Having 0.9 – 1.8 m GBH
Ponkunnam to Thoduphuza	53	235	-	-

3.2 BENEFITS OF AVENUE PLANTING ALONG ROAD SIDES

The following is an analysis to develop a Kerala specific tree planting plan.

One of the objectives of planting trees on the roadsides is to produce a softer greener landscape, which is not relevant for Kerala. This is mainly because; just outside the right of way (ROW) the same type of thick vegetation exists on private property, almost continuously along the roadsides.

The Second objective is to give shade to travellers. Thick vegetation already exists on private property and this need will be met to some extent, otherwise there shall be a determined effort to raise trees on the land-bordering the roadsides.

The Third objective can be to absorb excessive noise. This is also not applicable in general as there is thick lush green vegetation all over Kerala along almost all roadsides.

The Fourth objective is to raise social forestry; this is redundant in Kerala, as Kerala is covered by thick lush green vegetation. This coverage of trees has increased rapidly in the last 10 years, as the paddy cultivating lands turn evergreen (*Cocus nucifera*, *Areca catechu*, *Mangiferous indica*, etc) instead of seasonal green (Paddy cultivation). When the Paddy fields are converted a small percentage of the total area is actually converted to buildings but the remaining areas mostly support plantain, *Cocus nucifera*, *Areca catechu* etc. Most important is to uncompromisingly protect the remaining actual natural forest areas (flora and Fauna) and also to aggressively plant trees in any barren areas within the forest areas and also immediately adjacent to forest areas.

The Fifth objective is to act as a natural filter to the traffic emissions. The roadside trees already exist outside of the right of way (ROW) and will act as the natural filter, hence this argument also not valid for Kerala.

Tree planting control soil erosion and provide increased slope stability. This is true in the case of elevated areas of Kerala. This can be achieved by other engineering techniques such as retaining walls, gabions, grass sods etc. The fact that most of the existing roads are already stabilised after

years of monsoons is also not very much in favour of planting trees.

3.3 COMPENSATORY TREE PLANTING

The compensatory tree planting strategy is based on the survival rate. The survival rate in Kerala is very high due to the favourable climatic conditions as evidenced by the existing biomass of the State.

Public trees The project will plant at least thrice the number of trees that will be removed from the KSTP-II road corridors. The maintenance of compensatory planting for of project roads will also be considered.

The total numbers of plants that will be necessary to be planted against the expected loss of 1340 trees is about 4020 trees. The project however targets much higher planting rates along the numerous Oxbow lands available as a result of the road realignments.

As an environmental enhancement measure the project will also aim to plant shrubs in and around the identified parking areas and Puramboke land.

3.4 SELECTION OF LOCATIONS FOR AVENUE PLANTATION

Criteria adopted for selection of locations for avenue tree plantation is based on availability of land margin within PWD road boundary. Proposed RoW of this link road varies from min. 12m to max. 20m depending on the landuse pattern of the corridor. Hence an average of 15m RoW was kept for the entire road stretch to estimate the length of land available along the corridor. The Table 2.0 shows the length of road stretch having more than 3m PWD land width beyond 15m RoW identified for avenue plantation.

TABLE 2.0. CHAINAGE WISE LOCATIONS PROPOSED FOR AVENUE PLANTATION

From Ponkunnam to Thodupuzha

LHS								RHS							
Sl. No.	From	To	Length	Sl. No.	From	To	Length	Sl. No.	From	To	Length	Sl. No.	From	To	Length
1	84220	84230	10	87	107970	107980	10	1	84000	84030	30	73	112890	112910	20
2	84560	84590	30	88	108160	108220	60	2	84350	84360	10	74	113270	113290	20
3	85480	85510	30	89	108250	108330	80	3	87030	87110	80	75	113500	113560	60
4	85740	85790	50	90	108770	108840	70	4	87470	87490	20	76	113780	113820	40
5	85820	85910	90	91	108910	108960	50	5	87700	87850	150	77	115120	115130	10
6	85950	86220	270	92	109450	109680	230	6	88020	88030	10	78	115720	115790	70
7	86240	86320	80	93	109750	109790	40	7	88240	88290	50	79	116370	116500	130
8	86410	86480	70	94	110330	110420	90	8	88660	88800	140	80	116570	116630	60
9	86570	86580	10	95	110440	110460	20	9	88970	88990	20	81	116660	116820	160
10	87110	87250	140	96	110630	110700	70	10	89240	89330	90	82	116880	116900	20
11	87310	87390	80	97	110970	111060	90	11	89650	89750	100	83	116990	117020	30
12	87430	87460	30	98	111230	111280	50	12	89930	90010	80	84	117110	117130	20
13	87570	87580	10	99	111570	111590	20	13	90100	90110	10	85	117160	117340	180
14	87860	87980	120	100	111620	111800	180	14	90440	90460	20	86	117360	117410	50
15	88330	88440	110	101	111980	112010	30	15	90520	90570	50	87	117440	117520	80
16	88690	88710	20	102	112060	112080	20	16	90780	90790	10	88	117660	117700	40
17	88930	88960	30	103	112140	112170	30	17	91640	91750	110	89	117770	118020	250
18	89080	89140	60	104	112310	112340	30	18	91810	91840	30	90	118280	118410	130
19	89530	89550	20	105	112460	112780	320	19	91870	91900	30	91	118500	118520	20
20	89580	89650	70	106	112820	112940	120	20	92910	92920	10	92	118620	118690	70
21	89760	89810	50	107	113510	113580	70	21	92970	93010	40	93	118850	118890	40
22	89870	90010	140	108	113810	113950	140	22	93140	93220	80	94	119260	119540	280
23	90100	90750	650	109	114020	114040	20	23	93430	93450	20	95	119710	119880	170
24	90850	90940	90	110	114150	114160	10	24	93770	93780	10	96	120270	120330	60
25	90970	91010	40	111	114190	114270	80	25	93900	93990	90	97	120360	120470	110
26	91030	91040	10	112	114350	114540	190	26	94890	94950	60	98	120580	120620	40

LHS								RHS							
Sl. No.	**From**	**To**	**Length**	**Sl. No.**	**From**	**To**	**Length**	**Sl. No.**	**From**	**To**	**Length**	**Sl. No.**	**From**	**To**	**Length**
27	91170	91300	130	113	114790	114830	40	27	95510	95660	150	99	120770	120820	50
28	91370	91390	20	114	114930	115020	90	28	96400	96410	10	100	120840	120850	10
29	91480	91490	10	115	115390	115430	40	29	97160	97190	30	101	120920	120930	10
30	91550	91590	40	116	116430	116720	290	30	97270	97310	40	102	121290	121430	140
31	91890	91900	10	117	116840	117090	250	31	98120	98210	90	103	121610	121980	370
32	91940	91980	40	118	117610	117640	30	32	98330	98350	20	104	122020	122080	60
33	92070	92080	10	119	118280	118460	180	33	98570	98580	10	105	122110	122130	20
34	92210	92220	10	120	118710	118760	50	34	98800	98830	30	106	122170	122350	180
35	92250	92320	70	121	119400	119450	50	35	99160	99220	60	107	122390	122440	50
36	92420	92540	120	122	119510	119880	370	36	99360	99400	40	108	122540	122590	50
37	92570	92580	10	123	120070	120080	10	37	99740	99760	20	109	122610	122710	100
38	92950	92970	20	124	120190	120450	260	38	99940	100070	130	110	122800	122920	120
39	93060	93110	50	125	120510	120520	10	39	100100	100150	50	111	122950	123000	50
40	93370	93480	110	126	120540	120770	230	40	100330	100350	20	112	123040	123170	130
41	93500	93540	40	127	120830	121160	330	41	100510	100530	20	113	123200	123220	20
42	93690	93720	30	128	121210	121670	460	42	100730	100810	80	114	123240	123250	10
43	93780	93820	40	129	121710	122010	300	43	101070	101080	10	115	123270	123290	20
44	93890	93900	10	130	122030	122590	560	44	101670	101680	10	116	123350	123400	50
45	94230	94250	20	131	122620	122640	20	45	102940	102970	30	117	123660	123740	80
46	94760	94780	20	132	122700	122940	240	46	103400	103410	10	118	123760	123840	80
47	95680	95710	30	133	123020	123040	20	47	103660	103680	20	119	123920	123930	10
48	97220	97230	10	134	123120	123270	150	48	103840	103880	40	120	124050	124230	180
49	97730	97890	160	135	123330	123350	20	49	103960	104020	60	121	124710	124720	10
50	98130	98140	10	136	123600	123630	30	50	104280	104290	10	122	124760	124840	80
51	98320	98330	10	137	123750	123800	50	51	104440	104480	40	123	124910	124920	10
52	98430	98540	110	138	123840	123850	10	52	104620	104670	50	124	125130	125190	60
53	99630	99640	10	139	123870	123960	90	53	104690	104720	30	125	125270	125330	60
54	99770	99810	40	140	124010	124230	220	54	104970	105010	40	126	125720	125850	130
55	99890	99950	60	141	124360	124380	20	55	105150	105180	30	127	126770	126780	10

LHS								RHS							
Sl. No.	**From**	**To**	**Length**	**Sl. No.**	**From**	**To**	**Length**	**Sl. No.**	**From**	**To**	**Length**	**Sl. No.**	**From**	**To**	**Length**
56	100120	100150	30	142	124400	124450	50	56	105430	105480	50	128	126830	126860	30
57	100220	100240	20	143	124530	124570	40	57	106520	106540	20	129	127470	127480	10
58	100320	100330	10	144	124640	124810	170	58	106660	106680	20	130	127750	127770	20
59	100410	100430	20	145	124890	124900	10	59	107470	107480	10	131	128300	128390	90
60	100670	100770	100	146	124930	124960	30	60	108350	108400	50	132	128590	128820	230
61	100800	100820	20	147	125080	125190	110	61	108970	109040	70	133	129030	129150	120
62	100850	100860	10	148	125270	125350	80	62	109230	109260	30	134	129200	129230	30
63	101190	101270	80	149	125370	125730	360	63	109680	109760	80	135	129390	129400	10
64	101650	101670	20	150	125790	125840	50	64	109790	109840	50	136	129620	129630	10
65	102010	102020	10	151	126600	126630	30	65	110520	110570	50	137	129650	129720	70
66	102060	102070	10	152	126650	126760	110	66	110640	110650	10	138	129890	129900	10
67	102150	102180	30	153	126800	126970	170	67	110750	110780	30	139	130220	130260	40
68	103060	103080	20	154	127020	127150	130	68	110860	110930	70	140	130320	130350	30
69	103130	103150	20	155	127370	127430	60	69	111130	111160	30	141	130530	130630	100
70	103270	103320	50	156	127490	127510	20	70	111550	111600	50	142	130960	131010	50
71	103420	103450	30	157	127570	127590	20	71	111720	111760	40	143	131150	131170	20
72	104000	104080	80	158	127840	127890	50	72	112360	112440	80	144	131360	131380	20
73	104150	104160	10	159	127920	127930	10					**Total Length in m**			**8470**
74	104210	104220	10	160	128140	128160	20								
75	104250	104260	10	161	128330	128340	10								
76	104330	104350	20	162	128410	128520	110								
77	104730	104750	20	163	128790	128850	60								
78	104800	104820	20	164	128880	128940	60								
79	104940	105370	430	165	128980	129000	20								
80	105450	105480	30	166	129080	129090	10								
81	106420	106440	20	167	129120	129280	160								
82	106830	106890	60	168	129520	129590	70								
83	107270	107410	140	169	129890	129970	80								
84	107460	107570	110	170	130050	130160	110								

LHS								RHS							
Sl. No.	**From**	**To**	**Length**	**Sl. No.**	**From**	**To**	**Length**	**Sl. No.**	**From**	**To**	**Length**	**Sl. No.**	**From**	**To**	**Length**
85	107660	107790	130	171	130560	130580	20								
86	107890	107930	40	172	131070	131200	130								
				Total Length in m			**14070**								

3.5 SELECTION OF TREE SPECIES FOR PLANTING

This aspect is a bit contentious with regard to the roadside plantations especially the planting of fruit bearing trees along the roadsides. In the case of the Kerala State Transport Project, the tree planting area is mainly away from the actual road corridor along oxbow lands. However planting of fruit bearing trees are not recommended as it may create any problem for the road traffic. The table 3.0 and 4.0 are the common trees recommended and that can be planted along the sides of the roads.

The distance and the space available is also a problem in Kerala. Further, the two species of Banyan trees i.e. the *Ficus religosa* and *Ficus bengalansis* are generally not recommended due to its irregular uncontrolled growth and also because of its religious association. Actually religious association is an environmental friendly positive aspect against tree cutting. Over a period of time if the road authority wanted to widen the road it may be difficult to remove religious trees. The situation is better in Kerala, as the attitude of the public is different.

The fruit bearing trees are usually attracted by children and hence could lead to accidents. The other side is that with the development going faster the fruits and nuts available for the birds and animals like squirrel are very less. The roadside fruit bearing trees normally helps the birds, animals, and lead to a nesting of birds etc. For this to be effective there shall not be any harvesting in certain declared areas. In these areas the Indigenous species are always preferred against the exotic species. The recommended species are the same as that of the occurring species except the Peepal and banyan trees. The indigenous species recommended are shown in Table 3.0 and 4.0.

3.6 TREE PLANTING ALONG OXBOW LANDS

In rural areas, it is an accepted fact that the improvement of roads will result in the formation of numerous 'oxbow lands' all along the mid lands and in the highlands. The oxbow lands are the existing roads where the road realignments are proposed. This is similar to the OXBOW LAKES formed during the evolution of rivers hence the name for easier identification for environmental management. This is in general not true in the case of the coastal area. The coastal Kerala is generally plain and hence all roads evolved in this area are generally straight.

TABLE 3.0. COMMON AVENUE TREES TO BE PLANTED WITHIN THE PURAMBOKE LAND AND 'OXBOW LANDS'

Sl No	Botanical name	Common Name
1	*Samnea saman*	Rain tree
2	*Spathodea campanulata*	Tulip tree
3	*Tamarindus indica*	Tamarind
4	*Butea monosperma*	Flame of the forest
5	*Delonix regia Raf*	Gulmohar
6	*Melia azaderach Linn*	Bead tree
7	*Michelia champaca*	Champakam
8	*Holarrhena antidysenterica*	Kudakapala
9	*Peltophorum pterocarpum Backer*	Rusty shield bearer
10	*Cassia fistula Linn*	Kanikkonna
11	*Jacaranda mimosifolic*	Jacaranda
12	*Delomix regia*	Gulmohar
13	*Polyalthia longifolia Var Pendula*	Asoka

TABLE 4.0. SHRUBS TO BE PLANTED WITHIN THE PURAMBOKE LAND AND 'OXBOW LANDS'

Sl No	Scientific Name of Shrubs
1	*Aerva javanica*
2	*Aerva pseudotomentosa*
3	*Cassia auriculata*
4	*Clerodendron phloemoides*
5	*Crotolariaburhia*
6	*Capparis aphylla*
7	*Calotropis procera*
8	*Calligonum polygonoides*
9	*Euphoria bivula*
10	*Grewia tenex*
11	*Indigifera argentina*
12	*Laptadenia pyrotechniea*
13	*Ziziphus spp.*
14	*Cazzia Amriculata*
15	*Medicinal Plants*

(Source: Kerala Forest Development Corporation, Consultants)

The importance of the proper management of these oxbow lands is there for an unavoidable outcome of the project. There were many alternatives available for the highway authority. Tree planting all along these oxbow lands could be very useful for the environmental enhancement of the region. This will help positively for tourism industry.

The Realignment/ Oxbow lands along the corridor are presented in Table 5.0. Length of the realignments may change depending on the final alignment for development. The plants indicated in Table 3.0 and 4.0 are the most acceptable local trees and shrubs. In all oxbow land both shrubs and trees are required.

TABLE 5.0. REALIGNMENTS/OXBOW LAND ALONG PONKUNNAM – THODUPUZHA CORRIDOR

Sl No	Chainage (km)		Proposed Treatment of Oxbow land Enhancement
	Start	End	
1	89+990	90+100	C
2	90+100	90+170	C
3	90+300	90+470	C
4	91+430	91+610	C
5	91+760	91+200	C
6	92+080	92+220	C
7	94+530	94+680	C
8	98+180	98+280	C

Sl No	Chainage (km)		Proposed Treatment of Oxbow land Enhancement
	Start	End	
9	108+050	108+180	C
10	108+200	108+360	C
11	109+100	109+200	C
12	109+620	109+770	B (2)
13	116+800	117+000	C
14	120+300	120+430	C
15	126+900	127+000	C
16	130+850	131+000	C
17	109+100	109+200	C

In urban areas the oxbow lands will serve as local service roads for the local vehicles. This also requires tree-planting depending on the length of the urban area and the length of the oxbow land.

4. SOCIAL ACCESSIBILITY OF OXBOW LANDS

Oxbow lands are proposed to be developed in three categories. Type-A, Type-B and Type-C.

Where a considerable extent of area is available due to realignment, Type-A and Type B category of oxbow land is proposed to be developed. The approximate cost for such oxbow lands is estimated to be around Rs.30,00,000 included in Environment Cost, which will be incurred by KSTP.

At minor realignment locations, where the land to provide parking space for vehicles is scarce, only landscaping is provided to improve the aesthetics of the road and also with environmental considerations. This type of oxbow land is categorised as Type-C and the cost estimated for such type is around Rs. 2,00,000, which will be incurred by Contractor .

As GoK is yet to identify a socially, environmentally and economically viable development proposal for oxbow lands which need inter departmental collaboration and coordination, the oxbow land development is not included as part of the BOQ of this project and can be implemented as a separate activity. However, tree planting and other general landscaping works in locations where sufficient land is not available for oxbow developments (Type C) are included in BOQ.

Locations of oxbow lands for this link corridor are identified and presented in Table 5.0. Detailed drawing of Type C oxbow land are presented in drawing No. PT 1D 60-012 to 013

5. PLANTATION SPECIFICATIONS

5.1 DETAILS OF NURSERIES

Kerala Forest Development Corporation (KFDC) has facilities for raising nurseries at various places as shown in Table 6.0. Depending on necessity, nurseries can be raised in nearby private lands taken on short-term lease by KFDC.

TABLE 6.0. LOCATION OF NURSERIES

Sl.No	District	Location
1	Kollam	Arippa
2	Kollam	Kandanchira
3	Kottayam	Nagambadam
4	Thrissur	Payyannur
5	Palakkad	Silent Valley
6	Palakkad	Malampuzha
7	Wayanad	Kambamala

5.2 ADDRESS OF CONTACT PERSON

Divisional Manager, KFDC Ltd., Thycaud. P. O., Thiruvananthapuram. Phone: 320604

Divisional Manager, KFDC Ltd., Tholicode. P. O., Punalur, Phone: 222316, 222317

Divisional Manager, KFDC Ltd., 1/702, Chintha, Kannimangalam. P. O., Thrissur, Phone: 0487 – 427433, 443189

Divisional Manager, KFDC Ltd., Rethi Mandiram, Chemmenthodu, Pothundi. P. O., Nemmara. Phone: 0492 – 344332.

Divisional Manager, KFDC Ltd., Munnar - 685612.Phone: 0486 30332

Divisional Manager, KFDC Ltd., House No: VIII/408. A, 'Love Dale', Padma Prabha Road, Kalpetta, Wayanad - 673121. Phone: 0493 – 605821

5.3 COST OF TREE PLANTING PLAN

It is preferable to use tall seedlings for avenue planting. It is suggested that one-year-old nursery seedlings raised in poly bags be used for the purpose. The approximate cost of a seedling is Rs. 15/-. The total cost will be about 4020 x 15 = Rs 60,300/-

5.4 COST OF TRANSPORTATION

An average amount of Rs. 25/- per plant may be provided for loading, transportation, unloading etc. This will be about 4020 X 25 = Rs 100,500/-

5.5 COST OF LABOUR CHARGES AND MATERIALS

This includes, site clearance, pitting, providing compost in the pit, filling the pit and making planting holes, planting the seedlings, weeding as and when required, replacing the causalities, application of bio fertilizer and bio pesticides, providing tree guards and ward. An amount of Rs.620/- per plant is required for the above purpose. This will be about 4020 X 620 = Rs.24,92,400/-.

5.6 COST OF MAINTENANCE FOR THE FIRST, SECOND AND THIRD YEAR

The operations involve replacing the causalities, weeding as and when required, application of bio fertilizer and bio pesticides, repair of tree guards, watch and ward and other plant protection measures. These operations may require 4020 X 80 = Rs.3,21,600/ per year during 1st, 2nd and 3rd year.

5.7 FRUIT BEARING PLANTS

Fruit bearing plants are not recommended for planting as planting such trees result in social and traffic problems involvement in protecting them. If planted, local people will have full access to the use of fruits from these plants. However, some of the fruit trees like *Syzygium cuminii* and *Phylanthus emblica* which are medicinal in nature can be planted without such issues and some others like *Artocarpus heterophyllus* which provide valuable timber along with fruits are not suitable for planting along road side.

6. MONITORING FORMATS

Monitoring may be done on a monthly basis using the format given in Table 7.0.

TABLE 7.0. MONITORING FORMAT

LOCATION	SPECIES PLANTED	NO. OF PLANTS PLANTED	NO. OF PLANTS SURVIVING AND PERCENTAGE	AVERAGE HEIGHT	REMARK ON GENERAL HEALTH OF PLANTS

7. BIO MANURE

Bio manures like compost, neem cake, Azatobactor are recommended instead of chemical fertilizers to make the scheme more eco friendly. About 10 gm Azatobactor together with 250 gram of neem cake or compost shall be used at the time of planting and as part of 2nd and 3rd year maintenance. Neem cake will also function as bio pesticide. Compost can be made from green leaves, coconut husk or urban waste materials. Normally the tree species suggested do not suffer from attack of pests and application of neem cake can be very effective prophylactic

treatment.

8. MULCHING AND PRUNING

Mulching at the end of monsoon shall be done with coconut husk, grass or green leaves after under taking a soil working around the plant in order to conserve moisture. Frequent watering of trees shall also be carried out to protect them from severe summer. Pruning of branches during 2nd and 3rd year shall be carried out to ensure proper stem formation and to ensure that the branches will not obstruct the traffic on the road.

9. PURAMBOKE LAND

In order to protect trees in Puramboke land, it is necessary to provide barbed wire fencing with four strands. The cost of planting decreases with size of land available. The cost of planting trees and shrubs and maintenance is approximately as follows.

1st year	Rs. 60,000/- per ha. Including fencing
2nd year	Rs. 15,000/- per ha.
3rd year	Rs. 10,000/- per ha.

For making an estimate a maximum of one hectare of Puramboke land is considered per Link. The necessary budget for this is Rs 85,000/- (Rupees eighty five thousand only) per link.

10. PAYMENT SCHEDULE

The major portion of the expenditure is at the pre planting and planting stages. Plantation will be carried out by the project Contractor with first year maintenance and cost for the same is considered in BOQ. Second and third year maintenance will be carried out by Contractor appointed by KSTP.

11. NOISE BARRIER

Although dissipation of complete noise is expensive and difficult to implement, some cost effective methods can be employed to reduce the noise level considerably. In order to create a healthy noise barrier the following considerations would help.

The species selection should be very careful. The selected species should have small but presence of innumerable green leaves each small leaf acting as noise attenuator. The space available between the school or silence zone and the road corridor could be the deciding factor.

The number of rows required creates an effective noise shield for the given circumstances. This actually depend on the space available between the road corridor and the building

The design provided is an ideal situation especially with regard to the location of school gate, assembly area, and tree planting area (one row of tree completely sealing the entry of direct noise).

The school activity area (ground for daily assembly, prayer meetings etc) should be planned away from the main high traffic road. This is applicable as guideline to new schools.

The School gate should be away from the main traffic road. If the situation does not permit the gate should be in any corner in such a way that the noise effect from the main road is minimum.

The planting within the ROW is not shown in the design layout. If situation permits this will add to the noise barrier and in fact effect increase to many fold because of noise first striking the trees (ROW) and Wall) and then before sound waves reach the tree barrier it has to pass through an open air area. The noise effect will be like that shown in the design from the road towards the building.

The species recommended for the tree planting is *Saraca asoca* (Asoka tree). However depending on the situation any trees with numerous relatively small leaves will be ideal.

The detailed design for the noise barrier is provided in the design drawings. Refer DPR Drawing No. PPT-1D-60-008.

12. LINK SPECIFIC ACTION PLAN FOR TREE PLANTING

12.1 TREE PLANTING AWARENESS CAMPAIGN

An Environmental Monitoring Unit (EMU) under the Public Works Department (PWD) at Thiruvananthapuram will take up this activity coordinating with local Engineers of each affected district for Panchayat level awareness meetings. The Environmental Officer will be solely responsible for the various activities. The EO needs to identify and invite the local people to participate in the programme.

The parties to be invited include

1) Representatives of parents, Students and teachers of the Schools and other educational institutions bordering the Project road
2) Forest officials - They will supply seedlings of the appropriate varieties to the local people and to the schools for planting.
3) Project Management Team (PMT of PWD) members
4) PWD local Staff
5) NGOs in the region as listed in the Project documents. If the local NGOs are not suited, the EO can select the most appropriate NGOs as the credibility of all NGOs can only be evaluated by their past activities.
6) Private Nursery owners
7) Panchayat representatives

Nurseries The forest nurseries of the Social forestry wing of the Department of Forests and Wild Life and also Kerala Forest Development Corporation *(KFDC)* will provide the seedlings on a continuous basis.

Frequency of meetings There should be at least four meetings at local Panchayat levels per year to evaluate the programme after planting of the trees. The meeting shall be attended by representative of school children's and teachers at all levels of education in addition to Panchayat Authorities. The PWD at State level should organize television and radio programmes in the local language.

Sources of Funding Tree plantation cost is already included in the Contractor cost which is part of bid document, which also includes the planting for noise barriers. Contractor will carry out planting trees along the corridor as and when the road construction is complete. This way, survival rate of trees can be ensured. The rest has to be raised locally. In Kerala, the panchayath authorities can provide local funding for organizing these meetings and action plans. The project provision for noise barriers also provides funding for schools and hospitals.

12.2 THE IDENTIFIED TREE PLANTING AREAS ALONG KSTP

Puramboke land: The Puramboke lands need to be identified after the construction is complete. It is estimated that considerable area will be available along the road ROW without creating any road safety issues. This will be available in patches only. The EO will be responsible for this work. This cannot be identified at this juncture because of the non-availability of legal Right of Way and the Contractors final choice of alignment based on the practical difficulties in running the equipment and machineries. The area could be useful for tree planting as well as parking areas and servicing areas. For making an estimate a maximum of one hectare of Puramboke land is considered per Link.

Oxbow land The KSTP II Oxbow lands are identified in the link specific EIA report as well as this annexure where realignment takes place. There are thirty three type C oxbow land in Link 84 as indicated in the Table 5.0 of this Annexure.

13. CONCLUSION & POLICY RECOMMENDATIONS

13.1 CONCLUSIONS

Along high priority roads, roadside planting should not be encouraged because of the narrow and winding nature of corridors coupled with other vegetation and climatic factors.

In general, considering the special condition of State roads, the roadside trees will increase the accident rates and their severity. Not only the vehicles but also the pedestrians are at an unacceptably high risk in Kerala.

The policy is not applicable to National Highways of the State as the Standards are better with very high safety standards. More over the roads are built very wide and straight. The main highways are located in the coastal plains of Kerala.

The project is committed to plant a minimum of 4020 trees as against the removal of 1340 trees from the high priority as well as maintenance corridors including the removal of private trees while widening. The scope of the planned KSTP I planting will be many times higher than the minimum requirement. The entire budget although included in the BOQ will be sub contracted separately with an agreement with Kerala Forest Development Corporation.

13.2 RECOMMENDATIONS

After the construction of the road, there should be a determined effort to persuade the landowners on both sides to plant shade trees along safe sections and to discourage at unsafe sections. This activity shall be at micro level i.e. at the Panchayat or village level with people's involvement. The household should know why these activities are required. There should be a determined effort by local schools, hospitals, Panchayat Municipal and Police authorities towards this. The ESMU will take up this activity for further follow up with a definitive action plan.

The strategy discussed is a general approach, depending upon the local situation; there can be variations.

Tree planting however should be considered in all 'Puramboke land' outside the required corridor so as not to interfere with the smooth and safe flow of traffic.

In the case of Kerala State Transport Project (KSTP) the main areas for tree planting are the so called 'oxbow lands' as the Puramboke land will be mostly utilized during the proposed improvement works. The oxbow lands shall be leased to NGOs preferably woman NGOs or to

families in the immediate vicinity as an income generating activity involving BPL[5] families.

PWD will have to develop a monitoring mechanism for the oxbow lands during operational stage to have an excellent control on the land and resources. PWD should consider the employment of local people for planting.

Notes: This recommendation does not affect the existing trees. Wherever possible, the existing trees have been protected by making necessary design changes.

[5] Below Poverty Families

Annexure 3. 51. Auto-Jeep- Tempo -Taxi Stands – Existing and Proposed

Sl. No.	Chainage	Type of Vehicle	Left/Right	Mitigation/Enhancement
1.	84+480	Taxi car	Left	Existing will be integrated
2.	88+870	Taxi car	Left	Existing will be integrated
3.	96+180	Auto rickshaw	Right	Existing will be integrated
4.	96+540	Jeep	Left	New parking area provided
5.	96+670	Auto rickshaw	Left	
6.	100+540	Auto rickshaw	Left	Existing will be integrated
7.	101+050	Auto rickshaw	Left	Existing will be integrated
8.	104+650	Auto rickshaw	Left	Existing will be integrated
9.	105+020	Auto rickshaw	Right	Existing will be integrated
10.	105+700	Jeep	Right	Not affected
11.	105+730	Auto rickshaw	Left	Existing will be integrated
12.	105+860	Mini lorry	Left	Not affected
13.	105+990	Auto rickshaw	Left	Existing will be integrated
14.	110+900	Auto rickshaw	Right	Existing will be integrated
15.	110+960	Auto rickshaw	Left	Existing will be integrated
16.	113+050	Auto rickshaw	Left	New parking area to be provided
17.	125+940	Taxi car	Left	Existing will be integrated
18.	126+100	Auto rickshaw	Left	Existing will be integrated
19.	133+220	Auto rickshaw	Right	Existing will be integrated
20.	133+620	Auto rickshaw	Left	Existing will be integrated
21.	133+900	Taxi car, jeep, auto rickshaw	Left	New parking area to be provided

Propose New Vehicle Parking Area

Sl. No.	Chainage	Station	Length (m)	Width (m)	Area (m2)	Parking For
1	96+600	Paika	50	7	350	Jeep, auto rickshaw
2	112+960	Kadanad	30	5	150	Auto rickshaw
3	133+980	Thodupuzha	50	7	350	Taxi car, jeep, auto rickshaw

Annexure 3. 52. Listed NGOs in the Region

Sl. No.	Name Of NGOs Contact Person & Phone Number	Address	Activities
1	Peermade development society, Director	Peermade development society Peermade Idukki	Promotes grass roots level organizations and undertakes development programmes sponsored by the Central and State Governments
2	Solidarity movement of india	Solidarity movement of india, central committee, idukki-kanjikuzhy po, Idukki-685 602.	Activities in areas of environment, consultancy project, rural technology, income generation, housing
3	Centre for Development Action , President	Vikas Institute, Kanakkari. P. O., Kottayam-686632 Tel: 0481-537917	Activities include pollution, rural technology, income generation, enterprise development
4	Gramin Udyog Yojana Contact person: Kurian Thomas	Vikas Works Compound, Near petrol pump, Erumely, Kottayam-686510	Provides vocational training facilities for unemployed and poor people, designs and implements programmes for employment generation in rural areas and promotes the welfare of the weak and disabled persons
5	Malanad Development Society,Contact person: Mathew Vadakkemuriyil	Kanjirappally, Kottayam-686507	Charity based social service organization, promoted the general welfare of the poor
6	Society for Integral Development Action Contact person: George Thomas	Koovapally, Kottayam	Promotes social development
7	Friends for Social Justice Contact person: V. Prabhakaran Nair, President	Parathodu. P. O., Kanjirappally, Kottayam-686543 Telephone: 0482-802959	Activities in the areas of income generation

Annexure 3. 53. Environmental Enhancement Drawings

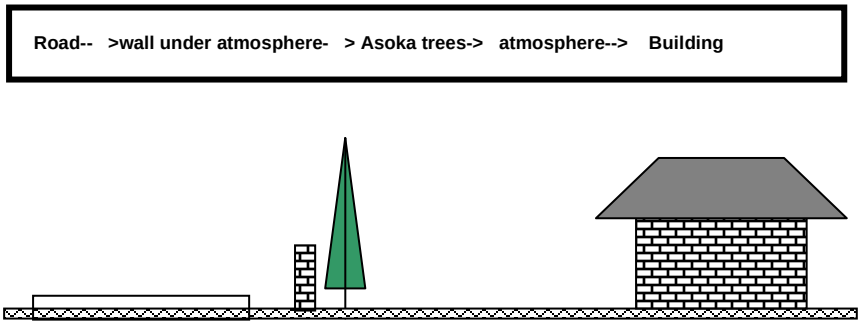
The Environmental enhancement drawings attached per table 1 are typical design drawings prepared for specific cases. These drawings clearly provide the concept for the preparation of other design drawings. In the case of oxbow lands (Original alignment of Realignment sections) these drawings are to be approved by the PMT and Environmental Management Unit (EMU). They should review the improvement plans, case-to-case based on the Local, Regional and State interests. The attached design drawings are typical deigns for parking areas, bus bays and tree planting etc and are not site specific. These drawings also include the concept of Typical Noise barriers developed by the project for consideration at the identified Silence zones. The details of these drawings are given below.

TABLE 1.0. ENVIRONMENTAL ENHANCEMENT DRAWINGS

SL NO	DRAWING NUMBER	LOCATION IF ANY	DETAILS OF THE DRAWING	REMARKS
1	PT 1D 60-011	At fifteen locations Type C oxbow land development is proposed	Drawing is not to scale. Arrangements shown are indicative and actual drawing shall be developed bythe Contractor .	Type C Oxbow land
2	PT 1D 60-008	Typical and is not location specific	Typical design of noise barrier in front of a school consisting of a stonewall and green barrier	All dimensions are in mm otherwise specified.
3	PT 1D 60- 003	Typical and is not location specific	Typical design for parking area along oxbow land	Number of slots varies according to the length of oxbow land
4	PT 1D 60-004	Typical and is not location specific	Parking area for autorickshaws. Arrows shows movement direction of vehicles.	All dimension are in metres unless otherwise specified.
5	PT 1D 60-005	Typical and is not location specific	Parking area for taxi cars, arrows shows movement direction of vehicles.	All dimension are in metres unless otherwise specified.
6	PT 1D 60-007	Typical and is not location specific	Typical layout of partial bus bay in urban area	All signs shall be as per IRC.67.2010 All markings shall be as per IRC.35.2010. All dimension are in mm unless otherwise specified.
7	PT 1D 60-009	Typical and is not location specific	Typical design for bus waiting shed with kiosk	All dimension are in mm unless otherwise specified.
8	PT 1D 60-010	Typical and is not location specific	Typical details of septic tank	All dimension are in mm unless otherwise specified.
8	PT 1D 60-012	Typical and is not location specific	Schematic drawing of catch drain and oil interceptor	All dimension are in mm unless otherwise specified.
9	PT 1D 60-013	Typical and is not location specific	Typical drawing of sedimation trench, storm water drain and green belt	All dimension are in mm unless otherwise specified.
10	PT 1D 60-014	Typical and is not location specific	Typical drawing of contour trench	All dimension are in mm unless otherwise specified.

The concept of Noise barrier design: The design drawing is an ideal condition, which rarely meets in its perfection in the location. The detailed guidelines are given in the **Annexure 3.8**. The concept of Noise barriers is as follows:

1) The design provided is an ideal situation especially with regard to the location of school gate, assembly area, and tree planting area (three rows of trees completely sealing the entry of direct noise.
2) The school activity area (ground for daily assembly, prayer meetings etc) should be planned away from the main road.
3) The Schools gate should be away from the main traffic road. If the situation dose not permits the gate should be in any corner in such a way that the noise effect from the main road is minimum
4) The planting within the ROW is not shown in the design layout. If situation permits this will add to the noise barrier and in fact the noise attenuation effect increase to many fold because of noise waves (energy waves) first striking the trees within the ROW and then the Wall and later sound waves reach the tree barrier. In the whole situation noise has to pass through a column of air also. The effect of noise will be like that shown in the sketch below from the road towards the building.
5) The species recommended for the tree planting is given in **Table 3.0** in **Annexure 3.50**. *Polyalthia* longifolia Var *Pendula* (Asok tree) is ideal for noise barrier. However depending on the situation any trees with numerous relatively small leaves could be ideal.



Annexure 3. 54. Spoil and Scarified Material Disposal Plan for Link 84

The following specific scenario is worked out to deal with the scarified material collection and disposal assuming that the entire length of link 84 road as overlay considered

The total link 84 road length = 124620m

Average width of scarification = 7m

Average thickness of scarification = 0.07m

Total scarified material available = 124620 X 7 X 0.07 = 61,063.8 m^3

The entire material will be required for base filling of the corridor and parking areas. The topsoil in all cases is about 50 cm. This will be removed and heaped to use for productive purposes. The total fill material required would be 50cm pit developed after the topsoil removal and additional 50 cm new scarified material would also be filled in the case of new alignments.

The mass balance would be achieved by filling along new alignments and also along the construction alignments for access roads etc. The total material required will be almost the same as that of the material available. Since the entire area is low land to midland, the scarified material will be required along the edges of the corridor. The detailed plan should be in conformity with the Construction scheduling prepared by the PMT. The Contractor will have to obtain approval from the Engineer regarding Contractors plan to use the material.

Annexure 3. 55. Cultural Properties Rehabilitation Measures

The project needs to develop measures for the rehabilitation of cultural properties that will be affected by the road improvement programme. This could be made a part of the broad R&R Principle and Policy Framework. The Environmental Budget with in the EMP will undertake the environmental enhancement and landscaping where as any land acquisition and rehabilitation will be part of the Resettlement Action Plan. The KSTP has been guided by the Bank's Draft Operational Policy 4.11, which exclusively deals with the cultural properties, in its handling of the affected cultural properties due to the project. Further, as desired by the Bank, this section of the EMP and RAP has been prepared as a separate safeguard measures exclusively for the Kerala State Transport Project.

What Does Cultural Property Mean?
The United Nations term "Cultural Property" includes sites having archaeological (prehistoric), palaeontological, historical, religious, and unique natural values. Cultural Property, therefore, encompasses both remains left by previous inhabitants, for example, middens, shrines, and battlegrounds) and unique natural environmental features such as canyons and waterfalls. The rapid loss of cultural property in many countries is irreversible and often unnecessary. Detailed background information on all aspects of this note are contained in the technical paper of the same title, available from the office of Environmental and Scientific Affairs, Project Policy Department of UN, which is ready to provide assistance on request.
Source: World bank Draft OP 4.11

1. TYPES OF RELIGIOUS PROPERTIES IDENTIFIED IN THE PROJECT LOCATION

The environmental and social surveys and the detailed social impact studies have identified all cultural properties (total 38 Nos) that will be affected by the Link 84 road. These are presented in **Table 2.0**. Their magnitude of being affected widely varies. The following types of cultural properties are found on the project roads:

1. Temple
2. Church
3. Mosque
4. Shrines of all the three major religions
5. Tree shrines/sacred groves
6. Roadside *hyundi* (money collection box) of all the three religions

Except the tree shrines, the others are not strictly "common property" because they are owned and managed by their respective registered "Society" or "Trust". The public only has access to them. As the table shows, there are 4 Hindu cultural properties, 14 Christian and 3 Muslim. Few cultural properties have encroached on the Government land (need to wait till RAP is compete). There are seventeen shrines are present. Most of the 100% affected properties are hyundi, which are also encroachers and could be easily relocated. Other properties are affected in terms of losing boundary walls or land.

1. DEFINITIONS

Shrines are usually small structures, located in the vicinity of the main religious structure associated with all the three major religions of the State. The shrines usually serve the purpose of helping the road users obtain a quicker religious service, besides indicating the larger presence of the religious community in the locality.

The shrines are a most important part of any place of worship. Normally a small shrine develops

to a bigger place of worship with earlier shrine remaining as the most important part of the property.

Temples are Hindu places of worship**.** There are private as well as community temples. Most of the temples are different from one another by way of age and idols (Shiva, Vishnu, Krishna etc). In a majority of the cases, the location has specific significance. Because of the same reason temples are usually located away from the Roads.

Churches are Christian places of worship. There are no private Churches. The churches usually belong to different groups within Christianity (Catholic, Marthoma, Syrian, Pentecostal, etc). Except few cases the location has no specific significance for a church.

Mosques are the places of worship of the Muslims. There are Sunny Mosques and Mujahiddin mosques. With regard to the rehabilitation policy, all mosques can be treated as belonging to the same type. There are no known location specific mosques in the project location.

Tree shrines are usually associated with the Hindus. There are a few tree shrines located along the project roads. People worship the idols installed at the base of the trees as well as the trees. These trees have a special significance to the local community, which will usually oppose the removal of such tree shrines. The landscaping would be ideal. This will require extensive community consultation.

Sacred groves are also usually associated with the Hindus. Even today, the Nair community in Kerala worship snakes and other demigods. For this purpose they preserve a small forest, known as sacred groves. This represents the close association of man with nature. Usually, landscaping would be ideal for the sacred groves.

Hyundi: these are box shaped structures of masonry work for money collections, maintained by the institutions of all the three major religions throughout the State. These are usually of one square metre area, placed strategically on the public right of way, essentially targeting the truck drivers and other motorists who do not have the time to visit the places of worship.

Direct Impacts: The direct impacts to the cultural properties are of the following category.

1. Only Compound wall affected
2. Compound wall and part of the compound affected
3. Part of structure affected
4. *Sanctum sanatorium* affected – can be categorised as the complete structure affected
5. Only land affected
6. Complete cultural property affected
7. Loss of access/entrance, if the existing access is from the project roadside.

Project Approach: In all cases, the mitigation actions are framed unique to that particular situation with respect to the available space, the unique characteristics of the religious structure affected and the local public and religious judgment. In other words, the project policy is unique to consider the widely varying situations for each cultural property.

Impact Mitigation: The loss of land and assets of the cultural properties will be treated on par with the loss of other land and assets for the purpose of compensation and assistance. However, the project will, in addition, strive to enhance benefits to the affected cultural

properties in consultation with their respective management/ Owners.

The project has a clear strategy to take people and affected parties in to confidence before taking any decision on shifting of structures especially religious structures. In general there would not be any involuntary shifting or relocation especially in the case of cultural properties. An outline benefits enhancement for the cultural properties is shown in the following Table 1.0.

TABLE 1.0. STRATEGY FOR RESTORATION, RELOCATION OR RECONSTRUCTION OF CULTURAL PROPERTIES

SL NO.	EXTENT OF IMPACT ON CULTURAL PROPERTIES	IF CONSULTATION CONDUCTED CONSENSUS OBTAINED	BENEFIT ENHANCEMENT
1	Only Compound wall and land beneath affected	Reconstruction of wall parallel to the present compound wall. Loss of land compensated.	Access/entrance provided through one of the sides
2	Compound wall and part of compound affected	Reconstruction of wall parallel to the existing wall. Loss of land compensated. If land is available adjacent to the property, will be purchased.	- Do -
3	Structure affected	Alternate structure constructed and all pre-status restored.	- Do -
4	Sanctum sanctorum affected	Complete structure reconstructed and all pre-status restored.	- Do -
5	Only land affected	Alternate land provided, preferably, if available, adjacent to the existing location.	-Do-
6	Complete cultural property affected	Relocation of site identified by the cultural property authorities and rebuilding of the property.	-Do-

2. OTHER IMPACTS TO CULTURAL PROPERTIES INCLUDE:

Indirect/Induced impacts: The construction of road or realignments or bypasses sometime will result in induced impacts obstructing the cultural properties in various ways. In the instances of such events the highway authority will assist through consultation and other means (Highway Protection Act, 2000) restoring the importance of the shrine. This will be mostly applicable along the new alignments.

3. CULTURAL PROPERTY REHABILITATION ACTION PLAN

The Rehabilitation Action Plan include environmental enhancement, design changes to save the structure from being affected. The project team further visited the site in August 2001 for three days from 27-08-2001 to 29-08-2001 to ascertain type of the impacts and also to devise typical designs for cultural property enhancement. It was also planned to make design changes or adjustments to save the cultural properties from being affected.

4. CULTURAL PROPERTY IMPACT ASSESSMENT, MITIGATION AND ENHANCEMENT PLAN

The cultural properties that will be affected by the Link 84 improvements are shown below in Table 2.0.

TABLE 2.0. CULTURAL PROPERTY IMPACT ASSESSMENT, MITIGATION AND ENHANCEMENT PLAN LINK 84

Sl. No.	Chainage	Cultural Resources	Left / Right of Road	Type of Affected Structure	Mitigation or Enhancement Actions
1.	82.230	Church	Right	Structure affected	Landscaping and enhancement
2.	84.140	Shrine	Right	Compound wall	New compound wall
3.	88.00	Temple & shrine	Right	Shrine and compound wall	New compound wall, landscaping and enhancement
4.	88.380	Temple, shrine	Left	Shrine and land	Landscaping and enhancement
5.	96.480	Church	Left	Wall affected	New wall will be constructed
6.	98.500	Church	Right	Compound wall affected	New wall will be constructed
7.	98.520	Shrine	Left	Fully affected	Landscaping and enhancement measures
8.	99.190	Shrine	Right	Wall affected	New wall will be constructed
9.	103.350	Church	Right	Compound wall affected	Landscaping and enhancement
10.	110.840	Shrine	Right	Structure	Landscaping and enhancement
11.	112.000	Temple	Left	Compound wall	New compound wall
12.	114.670	Shrine	Left	Structure	Landscaping and enhancement
13.	133.460	Shrine	Right	Compound wall affected	Landscaping and enhancement

The team found out three distinct cases for KSTP II impact mitigation. These are

Design changes made to save cultural properties Accordingly most of the cultural properties have been saved.

Relocation necessary In few cases some land acquisition will also be necessary.

Hundai The team could find that many shrines marked earlier by surveyors are not actually shrines they are all money collecting boxes of the shrines kept on roadsides. In Kerala, the removal and relocation of these sites will be relatively easier still need consultation with the affected groups.

Environmental Enhancement and landscaping. At least in many cases cultural property enhancement measures are necessary.