# **Initial Environmental Examination**

October 2022

India: Rajasthan State Highway Investment Program – Tranche 3 Volume 2 of 3, Appendix A-H

Prepared by PPP Division, Public Works Department, and Government of Rajasthan for the Asian Development Bank.

#### **CURRENCY EQUIVALENTS**

(as of 21 October 2022)

Currency unit – Indian Rupee (₹)

INR1.00 = \$0.012 \$1.00 = ₹82.83

#### **ABBREVIATIONS**

AE – Authority Engineer

ADB – Asian Development Bank
ASI – Archaeological Survey of India
BIS – Bureau of Indian Standard

BOQ – Bill of Quantities

CBD – Convention on Biological Diversity

CCF – Chief Conservator Forest CGM – Chief General Manager

CGWA - Central Ground Water Authority
CGWB - Central Ground Water Board
CPCB Central Pollution Control Board

CTE – Consent to Establish
CTO – Consent to Operate
CFO – Certificate for Operation

COP 26 - 26<sup>TH</sup> UN Climate Change Conference of Parties

CSC – Construction Supervision Consultant

dBA – Decibel

DEIAA – District Environment Impact Assessment Authority

DFO – Divisional Forest Officer
DGM – Deputy General Manager
DPR – Detailed Project Report
EA – Executing Agency

EAC – Expert Appraisal Committee

EARF – Environmental Assessment and Review Framework

EFP – Environment Focal Person

EIA – Environmental Impact Assessment
EMP – Environmental management plan
EMOP – Environmental monitoring plan

ERDAS – Earth Resources Data Analysis System

FGD – Focused Group Discussion FSO – Focal Safeguard Officer

FHWA – The Federal Highway Administration

GHG – Green House Gas

GIS – Geographic Information System

GM – General Manager

GOR - Government of Rajasthan
GOI - Government of India
GOR - Government of Rajasthan
GRC - Grievance Redress Committee
GRM - Grievance Redress Mechanism
GSDP - Goss State Domestic Product

IS – Indian Standard

IEE – Initial Environmental Examination
IMD – Indian Meteorological Department

IRC – Indian Road Congress

IUCN – International Union for Conservation of Nature

RPCB – Rajasthan Pollution Control Board

MDR – Major District Road

Leq – Equivalent Continuous Noise Level

MFF – Multi-tranche Financing Facility

MoEF&CC – Ministry of Environment, Forests and Climate Change

MORTH – Ministry of Roads Transport and Highway NAAQS – National Ambient Air Quality Standard

NSDP – Net State Domestic Product

NH – National Highway
ODR – Ordinary District Road
PCR – Physical Cultural Resources

PCU – Passenger Car Unit
PF – Protected Forest
PM – Particulate Matter
PD – Project Director

PIU – Project Implementation Unit
PPP – Public-Private Partnership
PWD - Public Works Department

REA – Rapid Environmental Assessment

RF – Reserved Forest

RCD – Road Construction Department

ROB – Road Over Bridge ROW – Right-of-Way RR – Rural Roads

SE – Superintendent Engineer

SEIAA – State Environment Impact Assessment Authority

SH – State Highway

SOE – Safeguard Officer – Environment SPS – ADB Safeguard Policy Statement, 2009

TEEMP - Transport Emissions Evaluation Model for Projects

TNM – Traffic Noise Model

UNESCO – United Nations Educational, Scientific and Cultural Organization
UNFCC – United Nations Framework Convention on Climate Change

USEPA Unite States Environment Protection Agency

WLS – Wildlife Sanctuary
WPA – Wildlife Protection Act

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# Appendix-A

### APPENDIX A: RAPID ENVIRONMENTAL ASSESSMENT CHECKLIST

Country/ Project Title: Rajasthan State Highways Improvement Program- Tranche3

Sector Division:	SATC

Screening Questions	Yes	No	Remarks		
A. Project siting Is the project area adjacent to or within any of the following environmentally sensitive areas?					
Cultural heritage site		х	No cultural heritage site is located within the road ROW or vicinity.		
Protected area		х	None of the project roads is inside or adjacent to any notified protected area.		
Wetland		х	None.		
Mangrove		х	None		
Estuarine		х	None		
The buffer zone of the protected area		х	None		
Special area for protecting Biodiversity		х	No special biodiversity area is located within the Project area.		
B. Potential environmental impacts	will the	project (	cause		
<ul> <li>Encroachment on Historical/cultural areas; disfiguration of the landscape by road embankments, cuts, fills, and quarries?</li> </ul>	x		No encroachment of historical places. However, some religious structures exist along anyone pf projects roads which may get partially impacted. Disfiguration of the landscape is not envisaged since it is an expansion/reconstruction of existing roads. Cut and fills are required only to improve the vertical profile of the road.		
Encroachment on precious ecology (e.g. sensitive or protected areas)?		x	No National Parks, wildlife sanctuaries, or similar eco-sensitive areas along with any one of the project's roads.  Erratic and undefined movement of wild animals mainly that of Nilgai (Blue bull) is reported in most of the projects. This species is under Schedule-III of wildlife act and not assessed as per IUCN. Due to its large population causing heavy crop damage, MOEF& CC has issued an advisory to include it in the Vermin category of Schedule V so that killing/hunting of such animals is the outside purview of regulations. State govt. has nominated Tehsildar, Ranger officers, and other officials of the same level to be the competent authority for killing such animals.  Adequate measures like conversion of existing pipe culverts to slab culverts, exclusively designed additional culverts, rumble strips, sign boards, speed restriction, etc. have been proposed to enable their free and safe movement.		
<ul> <li>Alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at the</li> </ul>		х	There is one perennial waterway being crossed by the project roads. Non perennial Rivers are Luni and Mithri River Jojri, Golasmi, Guniamata and Bastua (Jodhpur) small parts of Shekhawati River Basin(Churu) Sabi and Ruparail, Chuhar Sidh and		

		ı	
construction site?			Landoha. (Alwar & Bharatpur), Mahi and its tributaries Anas, Chap, Haran, Kadgi, and Nal (Banswara).  . 2 Major bridges have been proposed under project scope. Most of the minor bridges also have been retained. New minor bridges are proposed either on causeways or culverts with inadequate waterways.  All culverts construction will be done during the lean flow period. There is no waterway or water bodies near cut and fill locations.
Deterioration of surface water quality due to silt runoff and sanitary wastes from the worker- based camps and chemicals used in construction?		x	A temporary earthen bund or silt fencing will be provided around the construction site to avoid any sedimentation in nearby streams during rainfall.  Adequate sanitary facilities and drainage in the worker's camps will help to avoid this possibility.
<ul> <li>Increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?</li> </ul>			Air pollution level is likely to be increased for a short duration during the construction period. Appropriate distance from settlement area and wind direction may be taken into account to locate air polluting facility like stone crushing unit etc. use of environment-friendly equipment/machinery will help to reduce air pollution.
<ul> <li>Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation. Also due to COVID-19?</li> </ul>			Workers may be exposed to dust and noise during construction activities. However, the exposure levels are likely to be short. Workers will be provided requisite PPEs to minimize such exposure and associated harmful occupational health effects. Traffic on roads is expected to be low and as such, no occupational health hazard is anticipated during the operation phase. SOPs of COSHP will be strictly implemented.
Noise and vibration due to blasting and other civil works?	x		Blasting is not involved. The ambient noise level is expected to increase in the range of 70=80 DB (a) due to various construction activities, maintenance workshops, and earthmoving equipment. Although this level of noise exceeds national standards, their occurrence will be intermittent and co-terminus with the project construction. All stationary noise-making equipment will be installed with acoustic enclosures. Timings of noise construction activities will be regulated near sensitive receptors. Multilayered plantation proposed.
a Diplocation or invaluation			Quarry material will be procured from existing licensed quarries. Opening and operation of the new quarry, if needed will follow consent conditions of the Pollution Control Board and clearance from the State Environmental Impact Assessment Authority (SEIAA).
Dislocation or involuntary     resettlement of people		x	Minimal since improvement work will mostly be accommodated within available ROW Except for a few bypasses.  ROW encroachment in the project state is very
Dislocation and compulsory resettlement of people living in the right-of-way?		X	uncommon.
• Disproportionate impacts on the		X	The extent of impact being assessed. Pls, refer

		1	L. DD 1000
poor, women and children,			to RP an IPDP.
indigenous peoples, or other			
vulnerable groups?			D
<ul> <li>Other social concerns relating to</li> <li>inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress including those due to COCVID-19?</li> </ul>			Deterioration in ambient air quality will be localized and temporarily during construction activity. Regular water sprinkling to reduce the dust emission up to negligible standard. Noise barriers at sensitive receptors and community places will be provided to avoid any stress. Extensive plantations along the highway and improved road conditions will improve the air quality of the area. SOPs of COSHP will be implemented.
<ul> <li>Hazardous driving conditions where construction interferes with pre-existing roads?</li> </ul>	х		A suitable traffic management plan will be designed and implemented by the contractor to prevent any hazardous driving conditions in the above situations.
<ul> <li>Poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable?</li> </ul>	X		Proper provisions for sanitation, health care, and solid waste disposal facilities are included in the contract documents.
<ul> <li>diseases from workers to local populations?</li> </ul>		х	
<ul> <li>Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?</li> </ul>		x	No such risk is anticipated. Borrow areas are mostly from upland and digging is minimal hence ponding of water is not envisaged.
<ul> <li>Accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials?</li> </ul>	x		All road improvement, except for limited by- passes to minimize resettlement, will be undertaken along existing roads currently being used.
Increased noise and air pollution resulting from traffic volume?	x		An increase in noise and air pollution is expected during the construction phase from unpaved road travel, materials handling, earthmoving, and fumes from heavy equipment and processing plants. During operation, the increase in fumes from motor vehicles may increase.
<ul> <li>Increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?</li> </ul>		х	This is expected from accidental spillage. Adequate safety provisions have been proposed to avoid such situations.
<ul> <li>Social conflicts if workers from other regions or countries are hired?</li> </ul>		х	Most of the workers will be from local areas and hence such conflict is not anticipated.
<ul> <li>Large population influx during project construction and operation that causes an increased burden on social infrastructure and services (such as water supply and sanitation systems)?</li> </ul>		x	Workers will be mostly from local villages. Workers from remote places will be provided with the adequate facility.
<ul> <li>Risks to community health and safety, i.e. COVID-19 due to the transport, storage, use, and/or disposal of materials such as explosives, fuel, and other chemicals during construction and operation?</li> </ul>	x		Road construction involves handling hazardous substances like fuel, lubricants, explosives, and bitumen which poses risk during transport and storage. SOPs of COSHP will be implemented.
Community safety risks due to both accidental and natural causes including COVID-19, especially where the structural elements or	x		Adequate measures have been adopted to mitigate such risks.  Adequate awareness will be created amongst

components of the project are accessible to members of the affected community or where their	people and workers through information disclosure, safety signage and public consultation about safety aspects.
failure could result in injury to the community throughout project construction, operation, and decommissioning.	SOPs of COSHP will be implemented

#### A Checklist for Preliminary Climate Risk Screening

Country/Project Title: Rajasthan State Highway Improvement Program

Sector: Transport Subsector: Road

**Division/Department: SATC/SARD** 

	tment: SATC/SARD	Sooro	Remarks <sup>37</sup>
Screening Quest Location		Score 1	
and Design of the project	Is sitting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather-related events such as floods, droughts, storms, landslides?	ı	The project areas have a history of drought but this has very little impact on the road upgrading. The study area does not have a flood problem. However, none of the 7 project districts lie in flood-prone regions.
	Would the project design (e.g. the clearance for bridges) need to consider any hydrometeorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed, etc)?	0	All cross-drainage structures have been designed for 50 yr return period. Major bridges were designed to a 100 yr return period flood on the designed structure.  Embankment heights are proposed for raising for grade improvement and locations where overtopping was reported either due to local drainage problems or ponding due to overflow periods of rivers.
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind, and humidity hydrometeorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	Rajasthan is the largest state in India with two-thirds of its area as Thar desert. The Thar desert experiences low and erratic rainfall, high air and soil temperature, intense solar radiation, and high wind velocity. Based on the global climate model ensemble, the change in monthly future average high temperature from 2046-2065 at A2 scenario during peak summer months of April to June ranges from 2.4°C to 3.8°C from the historical monthly average of about 39°C. Based on surveys, rutting of asphalt increase rapidly when the air temperature is higher than 38°C, and serious rutting of pavement will happen in several days if the air temperature is continually higher than 40°C. The project design coincidentally addresses the risk of accelerated rutting as maintenance contract requires asphalt overlay every 10 years which is far less than the period of climate prediction.
	Would weather, current, and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	1	The warmest predicted average monthly temperature of about 39°C may increase the frequency of road repair due to rutting. However, this is minimal as this temperature is only breached during the month of April. Further, the 10-year asphalt overlay maintenance requirement to EPC Contractors ensures continued good road quality.
Performance	Would weather/climate	0	The predicted increase in temperature is at

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<sup>&</sup>lt;sup>37</sup> If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

of project	conditions, and related extreme	levels that may cause rutting but not at a scale
outputs	events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design lifetime?	that can jeopardize achieving the project objective of providing safe and efficient transport.

Options for answers and corresponding scores are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered a <u>low-risk</u> project. If adding all responses will result in a score of 1-4 and no score of 2 was given to any single response, the project will be assigned a <u>medium risk</u> category. A total score of 5 or more (which includes providing a score of 1 in all responses) or a 2 in any single response, will be categorized as a <u>high-risk</u> project.

Result of Initial Scr	eening (Low, Medium, High):	MEDIUM	
Other Comments:_			

Prepared by, Shakti Prakash, Environmental Specialist, PMC.

Appendix B: Baseline Air Quality Status in Project Areas)

SI. No.	Name of Location	Particulate Matter (PM <sub>2.5</sub> )	Particulate Matter (PM <sub>10</sub> )	Nitrogen Oxide (As NO₂)	Sulfur Dioxide (As SO <sub>2</sub> )	Carbon monoxide (as CO)
	Unit			μg/m3	-/	
		Pantiwara-Pipa	r-Merta City Ro	ad	T	T
1	0+13Km Near IOCL Vill. Indwar	48.12	90.53	25.47	10.65	0.62
2	0+38 Km Near Village Beetan	42.55	88.62	23.46	9.87	0.60
3	0+44Km Near Hotel Karni Place	40.58	90.36	23.8	9.9	0.63
4	0+60 Km Near Vill Naman	44.6	91.7	25.6	10.6	0.62
5	0+75 Km Near Village Bankaliya	39.45	87.21	22.55	10.48	0.61
6	0+91 Km Near Village Dantiwara	45.61	86.95	24.56	10.67	0.66
		anagar-Nohar	Road (Nohar To	Taranagar)	•	
1	0 to 12 Km ESSAR Petrol Pump	49.20	92.48	26.16	9.08	0.63
2	0 to 23 Km Village Meghana	40.20	90.62	23.36	8.74	0.67
3	0 to 34 Km Near Sri Shiv Gorakha Bhojanalya	38.29	86.48	22.06	9.92	0.60
4	0 to 46 Village Dhriwas Bada	36.12	86.29	24.48	8.26	0.62
5	0 to 60 Nr. Baaichara Hotel	32.24	83.48	20.27	9.10	0.60
6	0 to 71 Km HP Petrol Pump	41.26	94.20	28.49	9.92	0.66
		nagar-Nohar R	oad (Churau To	o Taranagar)	T	T
1	0+9.5 Km Near Achanak Family Restaurant	46.30	89.50	23.20	8.12	0.59
2	0+15 Km Nr. Temple	36.40	87.20	21.50	7.68	0.56
3	0+23 Near ESSAR Petrol Pump	37.32	81.10	20.54	9.42	0.63
4	0+34 Khatiya Dhani	34.20	81.71	22.63	7.94	0.60
5	0+41 Nr Raghav Hotal	28.98	79.23	18.96	8.75	0.62
6	0+46 Nr. Taranagar	35.31	78.90	20.61	7.44	0.56
			Kumher Road		T	T
1	0+7 Km	51.26	94.80	27.72	10.16	0.64
2	0+15 Km Nr. IOCL Petrol Pump	44.16	94.28	26.19	9.16	0.62
3	0+19 Km Nr. ESSAR Petrol Pump	42.06	91.28	24.06	10.14	0.64
4	0+25Km Nr. ESSAR Petrol Pump	38.31	92.28	26.16	9.42	0.67
5	0+32 Km Nr. Baboraa Passion	36.28	85.62	22.44	10.16	0.62
6	0+39 Km Nr. Village Kumher	47.92	96.16	29.14	10.92	0.68
			puri Rajya Seeı			
1	0+9 Km	44.24	90.16	25.48	10.93	0.61
2	0+18 Km	48.29	93.42	27.56	10.14	0.64
3	0+23 Km	51.06	96.48	29.34	11.57	0.66
4	0+34 Km	52.16	89.22	23.14	9.97	0.69
5 6	0+43 Km	39.18	90.26	26.07	11.34	0.65
0	0+51 Km	49.20	94.08	26.44	11.20	0.66

Appendix C: Noise Level in Project Area

Dantiwara Pipar Merta City (SH-21)				
Location Code	Location (Chain age)	Category	Leq ( Day)	Leq ( Night)
1	0+13 Km Nr. IOCL Vill Indawar	Commercial	62.54	48.78
2	0+38Km Near Village Beetan	Commercial	58.64	42.78
3	0+44 Km Near Hotal Karni Plance	Commercial	62.36	51.74
4	0+60 Km Near Village Nanan	Commercial	57.64	43.68
5	0+75 KM Near Village Bankaliya	Commercial	56.47	41.87
6	0+90Km Near Village Dantiwara	Commercial	62.65	52.97
Churu Tarana	agar Nohar (SH-36) (Nohar to Taranag	ar		
1	0 to 12 Km ESSAR Petrol Pump	Commercial	59.16	43.48
2	0 to 23 Km Village Meghana	Commercial	54.16	41.92
3	0 to 34 Km Near Sri Shiv Gorakha Bhojanalya	Commercial	61.26	51.48
4	0 to 46 Village Dhriwas Bada	Commercial	58.29	42.76
5	0 to 60 Nr. Baaichara Hotel	Commercial	63.49	43.56
6	0 to 71 Km HP Petrol Pump	Commercial	63.14	49.32
Churu Tarana	agar Nohar (SH-36) Churau To Tarana			
1	0+9.5 Km Near Achanak Family Restaurant	Commercial	54.18	43.57
2	0+15 Km Nr. Temple	Commercial	49.02	38.62
3	0+23 Near ESSAR Petrol Pump	Commercial	63.28	52.75
4	0+34 Khatiya Dhani	Commercial	59.37	43.25
5	0+41 Nr Raghav Hotal	Commercial	61.28	43.58
6	0+46 Nr. Taranagar	Commercial	53.78	42.67
Khelri Nabai	Kumher SH 44			-
1	0+7 Km	Commercial	61.28	44.37
2	0+15 Km Nr. IOCL Petrol Pump	Commercial	63.36	44.29
3	0+19 Km Nr. ESSAR Petrol Pump	Commercial	62.26	48.14
4	0+25Km Nr. ESSAR Petrol Pump	Commercial	63.14	43.56
5	0+32 Km Nr. Baboraa Passion	Commercial	64.42	52.28
6	0+39 Km Nr. Village Kumher	Commercial	62.89	51.48
	- Anandpuri Rajya seema Tak			
1	0+9 Km	Commercial	61.56	42.87
2	0+18 Km	Commercial	57.61	41.95
3	0+23 Km	Commercial	62.78	43.67
4	0+34 Km	Commercial	60.28	42.57
5	0+43 Km	Commercial	56.24	41.68
6	0+51 Km	Commercial	63.54	44.61

**Appendix D: Water Quality in Project Area** 

	Dantiwara-Pipar-Merta City Road					
S.			Result			
S. No	Parameters	unit	0+26 Km Near Kanji	0+60 Km Near		
NO			Hotel	Bhaichara Hotel		
1	Ph value @25°C	-	7.98	7.82		
2	Colour	Hazen	BDL( DL 1 Hazen)	BDL( DL 1 Hazen)		
3	Turbidity	NTU	BDL (DL 1 NTU)	BDL (DL 1 NTU)		
4	Odour	-	Agreeable	Agreeable		
5	Taste	-	Agreeable	Agreeable		
6	Total Hardness as CaCO <sub>3</sub>	mg/l	81.48	116.4		
7	Calcium (as Ca)	mg/l	24.88	34.21		
8	Alkalinity as CaCO₃	mg/l	77.76	97.2		
9	Chloride (as Cl)	mg/l	41.46	51.1		
10	Magnesium(as Mg)	mg/l	4.68	7.5		
11	Total Dissolved solids	mg/l	120	150		
12	Sulphate (as SO <sub>4</sub> )	mg/l	10.35	7.13		
13	Flouride (as F)	mg/l	BDL( DL 0.20 mg/l)	BDL( DL 0.20 mg/l)		
14	Nitrate as NO₃	mg/l	5.4	3.91		
15	Iron (as Fe)	mg/l	0.09	0.1		
16	Zinc as Zn	mg/l	BDL( DL 0.01 mg/l)	BDL( DL 0.01 mg/l)		
17	Copper as Cu	mg/l	BDL( DL 0.002 mg/l)	BDL( DL 0.002 mg/l)		
18	Manganese as Mn	mg/l	BDL( DL 0.01 mg/l)	BDL( DL 0.01 mg/l)		
19	Cadmium as Cd	mg/l	BDL( DL 0.002 mg/l)	BDL( DL 0.002 mg/l)		
20	Lead as Pb	mg/l	BDL( DL 0.002 mg/l)	BDL( DL 0.002 mg/l)		
21	Total Coliform	MPN/10 0ml	Absent	Absent		
22	E coli	Per 100 ml	Absent	Absent		

	Churu-Taranagar-Nohar Road								
			R	esult					
S.No	Parameters	unit	0+26 Km Near Kanji	0+60 Km Near					
			Hotel	Bhaichara Hotel					
1	Ph value @25°C	-	7.92	7.78					
2	Colour	Hazen	BDL( DL 1 Hazen)	BDL( DL 1 Hazen)					
3	Turbidity	NTU	BDL (DL 1 NTU)	BDL (DL 1 NTU)					
4	Odour	-	Agreeable	Agreeable					
5	Taste	-	Agreeable	Agreeable					
6	Total Hardness as CaCO <sub>3</sub>	mg/l	1402.62	121.09					
7	Calcium (as Ca)	mg/l	608.05	39.43					
8	Alkalinity as CaCO₃	mg/l	1421.28	100.28					
9	Chloride (as Cl)	mg/l	813.82	60.66					
10	Magnesium(as Mg)	mg/l	321.47	5.47					
11	Total Dissolved solids	mg/l	3390	380					
12	Sulphate (as SO <sub>4</sub> )	mg/l	384.69	10.74					
13	Flouride (as F)	mg/l	BDL( DL 0.20 mg/l)	BDL( DL 0.20 mg/l)					
14	Nitrate as NO <sub>3</sub>	mg/l	366.75	4.05					
15	Iron (as Fe)	mg/l	0.24	0.06					
16	Zinc as Zn	mg/l	BDL( DL 0.01 mg/l)	BDL( DL 0.01 mg/l)					
17	Copper as Cu	mg/l	BDL( DL 0.002 mg/l)	BDL( DL 0.002 mg/l)					
18	Manganese as Mn	mg/l	BDL( DL 0.01 mg/l)	BDL( DL 0.01 mg/l)					
19	Cadmium as Cd	mg/l	BDL( DL 0.002 mg/l)	BDL( DL 0.002 mg/l)					
20	Lead as Pb	mg/l	BDL( DL 0.002 mg/l)	BDL( DL 0.002 mg/l)					
21	Total Coliform	MPN/10 0ml	Absent	Absent					
22	E coli	Per 100 ml	Absent	Absent					

## Churu-Taranagar-Nohar Road

			R	esult
S.No	Parameters	unit	0+15 Km Near	0+41 Km Near Ragav
			Temple	Hotel
1	Ph value @25°C	-	7.23	7.65
2	Colour	Hazen	BDL( DL 1 Hazen)	BDL( DL 1 Hazen)
3	Turbidity	NTU	BDL (DL 1 NTU)	BDL (DL 1 NTU)
4	Odour	-	Agreeable	Agreeable
5	Taste	-	Agreeable	Agreeable
6	Total Hardness as CaCO₃	mg/l	2340.35	108.64
7	Calcium (as Ca)	mg/l	842.12	31.88
8	Alkalinity as CaCO₃	mg/l	1823	90.72
9	Chloride (as Cl)	mg/l	1824.34	46.28
10	Magnesium(as Mg)	mg/l	254.32	7.03
11	Total Dissolved solids	mg/l	5790	220
12	Sulphate (as SO <sub>4</sub> )	mg/l	720.36	6.05
13	Flouride (as F)	mg/l	BDL( DL 0.20 mg/l)	BDL( DL 0.20 mg/l)
14	Nitrate as NO <sub>3</sub>	mg/l	223.61	2.85
15	Iron (as Fe)	mg/l	0.26	0.1
16	Zinc as Zn	mg/l	BDL( DL 0.01 mg/l)	BDL( DL 0.01 mg/l)
17	Copper as Cu	mg/l	BDL( DL 0.002 mg/l)	BDL( DL 0.002 mg/l)
18	Manganese as Mn	mg/l	BDL( DL 0.01 mg/l)	BDL( DL 0.01 mg/l)
19	Cadmium as Cd	mg/l	BDL( DL 0.002 mg/l)	BDL( DL 0.002 mg/l)
20	Lead as Pb	mg/l	BDL( DL 0.002 mg/l)	BDL( DL 0.002 mg/l)
21	Total Coliform	MPN/10 0ml	Absent	Absent
22	E coli	Per 100 ml	Absent	Absent

		Khelri-Nabai-	Kumher Road		
			Re	esult	
S.No	Parameters	unit	0+32 Km Nr.	0+15 Km Near IOCL	
			Saboraa Passion	Petriol Pump	
1	Ph value @250C	-	7.86	7.82	
2	Colour	Hazen	BDL( DL 1 Hazen)	BDL( DL 1 Hazen)	
3	Turbidity	NTU	BDL (DL 1 NTU)	BDL (DL 1 NTU)	
4	Odour	-	Agreeable	Agreeable	
5	Taste	-	Agreeable	Agreeable	
6	Total Hardness as CaCO3	mg/l	995.22	232.72	
7	Calcium (as Ca)	mg/l	360.01	78.11	
8	Alkalinity as CaCO₃	mg/l	909.36	106.82	
9	Chloride (as Cl)	mg/l	520.69	68.49	
10	Magnesium(as Mg)	mg/l	23.13	9.1	
11	Total Dissolved solids	mg/l	2740	785	
12	Sulphate (as SO <sub>4</sub> )	mg/l	190.19	27.69	
13	Flouride (as F)	mg/l	BDL( DL 0.20 mg/l)	BDL( DL 0.20 mg/l)	
14	Nitrate as NO <sub>3</sub>	mg/l	260.8	4.05	
15	Iron (as Fe)	mg/l	0.26	0.21	
16	Zinc as Zn	mg/l	BDL( DL 0.01 mg/l)	BDL( DL 0.01 mg/l)	
17	Copper as Cu	mg/l	BDL( DL 0.002 mg/l)	BDL( DL 0.002 mg/l)	
18	Manganese as Mn	mg/l	BDL( DL 0.01 mg/l)	BDL( DL 0.01 mg/l)	
19	Cadmium as Cd	mg/l	BDL( DL 0.002 mg/l)	BDL( DL 0.002 mg/l)	
20	Lead as Pb	mg/l	BDL( DL 0.002 mg/l)	BDL( DL 0.002 mg/l)	
21	Total Coliform	MPN/10 0ml	Absent	Absent	
22	E coli	Per 100 ml	Absent	Absent	

	Pa	loda-Garhi-An	andpuri Road	
S.No	Parameters	unit	Re	sult
3.NO	Parameters	unit	Garhi Village @23	Indian Oil Pump @43
1	Ph value @250C	-	7.84	7.58
2	Colour	Hazen	BDL( DL 1 Hazen)	BDL( DL 1 Hazen)
3	Turbidity	NTU	BDL (DL 1 NTU)	BDL (DL 1 NTU)
4	Odour	-	Agreeable	Agreeable
5	Taste	-	Agreeable	Agreeable
6	Total Hardness as CaCO3	mg/l	985.52	249.74
7	Calcium (as Ca)	mg/l	348.34	84.17
8	Alkalinity as CaCO <sub>3</sub>	mg/l	892.08	119.9
9	Chloride (as Cl)	mg/l	610.36	74.36
10	Magnesium(as Mg)	mg/l	20.78	9.55
11	Total Dissolved solids	mg/l	2840	820
12	Sulphate (as SO <sub>4</sub> )	mg/l	196.67	26.99
13	Flouride (as F)	mg/l	0.82	0.24
14	Nitrate as NO <sub>3</sub>	mg/l	252.65	12.66
15	Iron (as Fe)	mg/l	0.27	0.08
16	Zinc as Zn	mg/l	BDL( DL 0.01 mg/l)	BDL( DL 0.01 mg/l)
17	Copper as Cu	mg/l	BDL( DL 0.002 mg/l)	BDL( DL 0.002 mg/l)
18	Manganese as Mn	mg/l	BDL( DL 0.01 mg/l)	BDL( DL 0.01 mg/l)
19	Cadmium as Cd	mg/l	BDL( DL 0.002 mg/l)	BDL( DL 0.002 mg/l)
20	Lead as Pb	mg/l	BDL( DL 0.002 mg/l)	BDL( DL 0.002 mg/l)
21	Total Coliform	MPN/10 0ml	Absent	Absent
22	E coli	Per 100 ml	Absent	Absent

**APPENDIX-E: Soil Quality in Project Areas** 

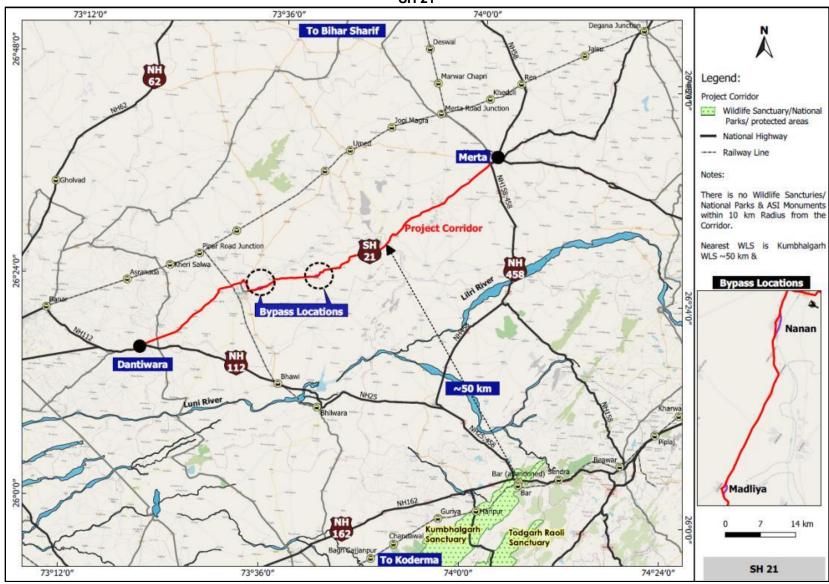
	Dantiv	ara-Pipar	-Merta City Road	
		1. 2	,	Location
S.No	Parameters	Unit	0+28Km Near Village Beetan	0+75 Km Near Village Bankaliya
1	Ph value @25°C	-	7.84	7.87
2	Electrical Conductivity	mS/cm	0.326	0.334
3	Colour	-	Brownish	Brownish
4	Water Holding Capacity	%	38.9	39.12
5	Bulk Density	gm/CC	1.32	1.43
6	Cloride	mg/Kg	151.46	118.64
7	Calcium (as Ca)	mg/Kg	246.87	236.59
8	Sodium (as Na)	mg/Kg	142.66	110.47
9	Potessium (as K)	Kg/Hec.	118.74	136.75
10	Organic Matter	%	0.54	0.58
11	Magnesium (as Mg)	mg/Kg	36.82	8467
12	available Nirogen (as N)	Kg/Hec.	292.59	268.12
13	Total Zink (as Zn)	mg/Kg	28.47	36.47
14	Total Manganese (as Mn)	mg/Kg	27.46	71.53
15	Total Chromium (as Cr)	mg/Kg	15.31	18.54
16	Total Lead (as Pb)	mg/Kg	1.84	3.21
17	Total Cadmium (as Cd)	mg/Kg	14.23	10.87
18	Total Copper (as Cu)	mg/Kg	16.28	16.98
19	Soil Texture	-	Sandy loam	Sandy Loam
	Chur	u-Taranag	ar -Nohar Road	
				Location
S.No	Parameters	Unit	0+26Km Near Kansi Hotel	0+60 Km Near Bhaichara Hotel
1	Ph value @25°C	-	7.84	7.92
2	Electrical Conductivity	mS/cm	0.302	0.324
3	Colour	-	Brownish	Brownish
4	Water Holding Capacity	%	38.9	38.22
5	Bulk Density	gm/CC	1.38	1.42
6	Cloride	mg/Kg	143.16	114.75
7	Calcium (as Ca)	mg/Kg	264.35	236.59
8	Sodium (as Na)	mg/Kg	151.51	102.48
9	Potessium (as K)	Kg/Hec.	121.27	126.22
10	Organic Matter	%	0.57	0.59
11	Magnesium (as Mg)	mg/Kg	38.26	82.45
12	available Nirogen (as N)	Kg/Hec.	292.31	271.62
13	Total Zink (as Zn)	mg/Kg	32.84	36.54
14	Total Manganese (as Mn)	mg/Kg	28.22	68.22
15	Total Chromium (as Cr)	mg/Kg	12.64	14.89
16	Total Lead (as Pb)	mg/Kg	1.98	2.57
17	Total Cadmium (as Cd)	mg/Kg	14.57	9.25
18	Total Copper (as Cu)	mg/Kg	13.62	15.64
19	Soil Texture	-	Sandy loam	Sandy Loam

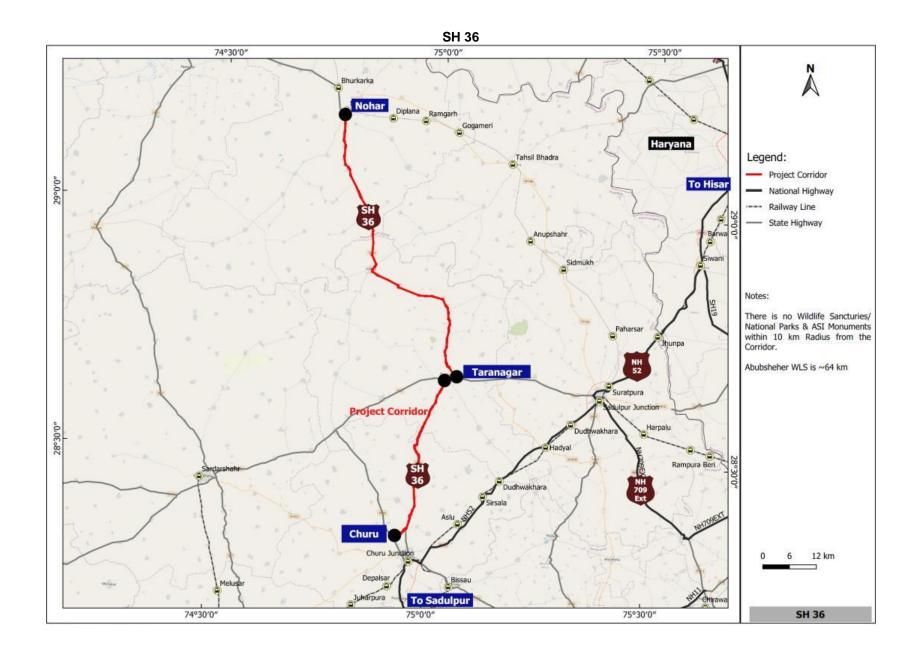
•									
	Churu	ı-Taranaga	ar- Nohar Road						
				ocation					
S.No	Parameters	Unit	0+15 Km Near	0+14 Km Near					
			Temple	Raghav Hotel					
1	Ph value @25°C	-	7.75	7.98					
2	Electrical Conductivity	mS/cm	0.298	0.346					
3	Colour	-	Brownish	Brownish					
4	Water Holding Capacity	%	38.5	36.5					
5	Bulk Density	gm/CC	1.36	1.4					
6	Cloride	mg/Kg	140.31	110.61					
7	Calcium (as Ca)	mg/Kg	260.27	232.48					
8	Sodium (as Na)	mg/Kg	146.5	96.9					
9	Potessium (as K)	Kg/Hec.	128.33	124.14					
10	Organic Matter	%	0.59	0.6					
11	Magnesium (as Mg)	mg/Kg	36.42	74.35					
12	available Nirogen (as N)	Kg/Hec.	297.23	264.24					
13	Total Zink (as Zn)	mg/Kg	34.41	34.62					
14	Total Manganese (as Mn)	mg/Kg	32.16	63.27					
15	Total Chromium (as Cr)	mg/Kg	14.31	14.22					
16	Total Lead (as Pb)	mg/Kg	2	2.34					
17	Total Cadmium (as Cd)	mg/Kg	16.11	8.61					
18	Total Copper (as Cu)	mg/Kg	16.98	13.63					
19	Soil Texture	-	Sandy loam	Sandy Loam					
	Khe	Iri-Nabai-k	Cumher Road						
				ocation					
S.No	Parameters	Unit	0+32Km Near	0+15 Km Near					
			Sabora Passion	Nr. IOCL Petrol Pump					
1	Ph value @250C	-	7.92	7.86					
2	Electrical Conductivity	mS/cm	0.314	0.328					
3	Colour	-	Brownish	Brownish					
4	Water Holding Capacity	%	37.6	38.45					
5	Bulk Density	gm/CC	1.34	1.4					
6	Cloride	mg/Kg	146.37	112.61					
7	Calcium (as Ca)	mg/Kg	261.85	232.84					
8	Sodium (as Na)	mg/Kg	146.21	104.68					
9	Potessium (as K)	Kg/Hec.	123.55	128.46					
10	Organic Matter	%	0.55	0.68					
11	Magnesium (as Mg)	mg/Kg	34.62	81.62					
12	available Nirogen (as N)	Kg/Hec.	298.51	270.57					
13	Total Zink (as Zn)	mg/Kg	31.47	35.69					
14	Total Manganese (as Mn)	mg/Kg	26.89	67.38					
15	Total Chromium (as Cr)	mg/Kg	14.55	16.24					
16	Total Lead (as Pb)	mg/Kg	1.85	2.97					
17	Total Cadmium (as Cd)	mg/Kg	13.56	10.37					
18	Total Copper (as Cu)	mg/Kg	12.84	16.5					
19	Soil Texture	-	Sandy loam	Sandy Loam					

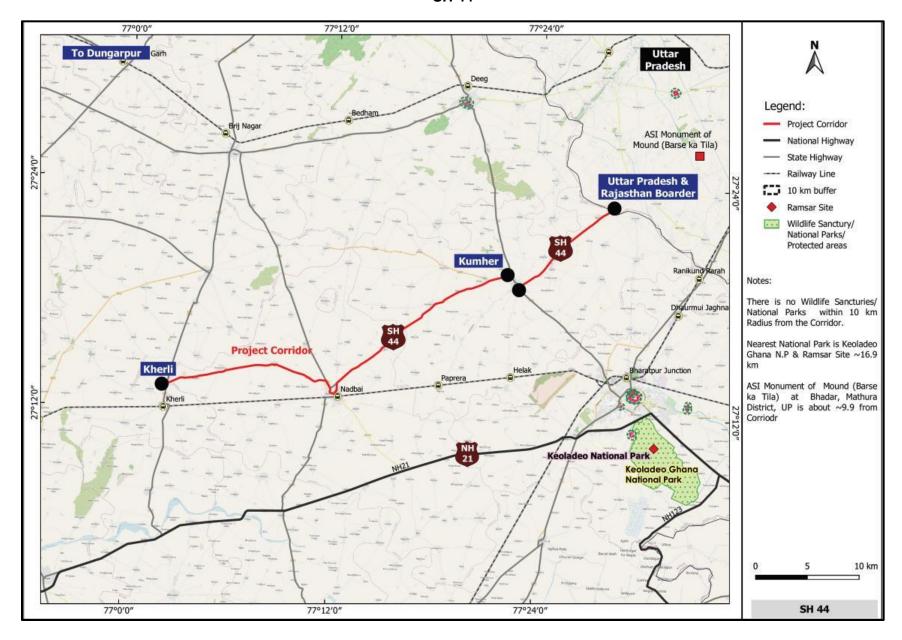
	Paloda-Gar	hi-Anandp	ouri (Rajya seema Tal	k)
S.No	Parameters	Unit	Loc	cation
3.NO	Parameters	Onit	Garhi Village @ 23	Indian Oil Pump @43
1	Ph value @250C	-	7.86	7.72
2	Electrical Conductivity	mS/cm	0.318	0.322
3	Colour	-	Brownish	Brownish
4	Water Holding Capacity	%	38.2	36.14
5	Bulk Density	gm/CC	1.36	1.38
6	Cloride	mg/Kg	142.29	108.19
7	Calcium (as Ca)	mg/Kg	248.14	316.61
8	Sodium (as Na)	mg/Kg	142.18	98.27
9	Potessium (as K)	Kg/Hec.	118.36	122.18
10	Organic Matter	%	0.56	0.59
11	Magnesium (as Mg)	mg/Kg	36.22	78.38
12	available Nirogen (as N)	Kg/Hec.	286.08	259.22
13	Total Zink (as Zn)	mg/Kg	27.56	32.56
14	Total Manganese (as Mn)	mg/Kg	25.19	64.12
15	Total Chromium (as Cr)	mg/Kg	13.28	15.28
16	Total Lead (as Pb)	mg/Kg	1.82	2.56
17	Total Cadmium (as Cd)	mg/Kg	12.29	9.27
18	Total Copper (as Cu)	mg/Kg	11.16	18.18
19	Soil Texture	-	Sandy loam	Sandy Loam

**Appendix F: Road Maps** 

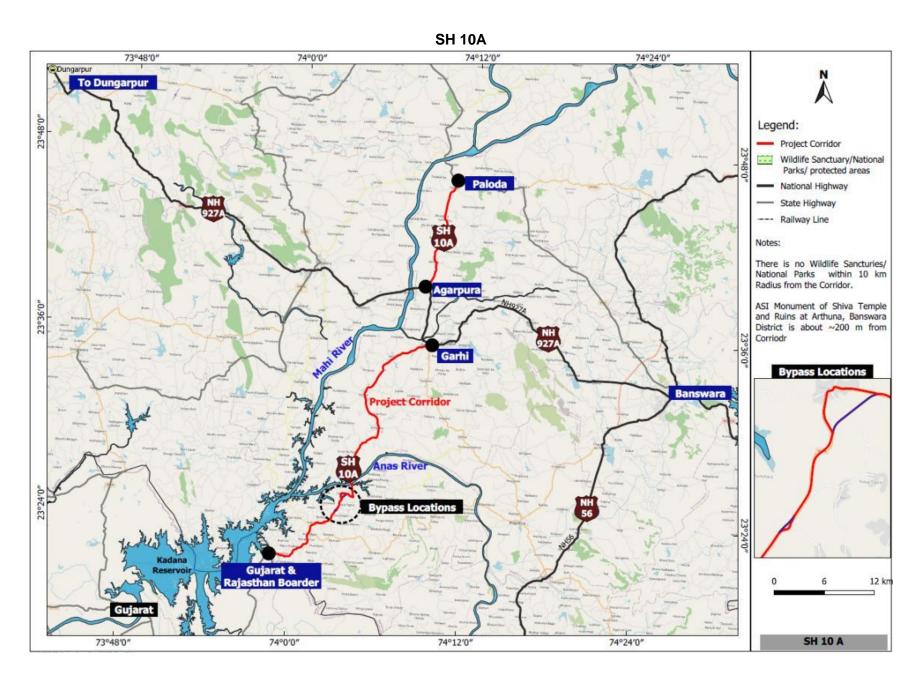








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# Appendix G: Each Road Specific EMP and EMoP ENVIRONMENT MANAGEMENT PLAN FOR DANTIWARA-MERTA CITY ROAD

Environmental	Remedial Measure	Reference to laws/		Monitoring indicators	Monitoring	Mitigation		utional nsibility
Issue/Componen t	Remediai Measure	guideline				Implement ation	Supervision /Monitoring	
	e-construction Stage							
	vement/ Drainage	r <u>-</u> -	-	T	T =	Г _	1 _	T
1.1. Alignment Design	in accordance with the provisions of the following IRC and BIS Codes/MoRTH guidelines/AASHTO specifications.  Geometrical design standards will mostly follow.	the Manual of Specificatio ns and Standards for Two		of near miss, incident, accident, safety parameters etc w.r.t to designed alignment.  PT: Design in compliance to prescribed Standards.  MI: Design Parameter's compliance to prescribed Standards.  PT: Designs are in accordance with site	detail design documents & drawings and comparison with site conditions	preliminary		PMC/RPWD-PIU-PPP
	Carriageway:							

Environmental	Barra Pal Marana	Reference		Monitoring indicators		Bard's and the se		utional ensibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
1.2. Pavement Design	<ul> <li>Carriageway Width = 7.5m each with 1.5m Median.</li> <li>Paved Shoulder Width = 2 x 1.5m,</li> <li>Paver Block Shoulder Width = 2 x 2.0m or varying width shoulder.</li> <li>Side Drain = 2 x 1.5m footpath drain</li> <li>Roadway Width = 30.0m (Approx.)</li> <li>Roadway Length = 18.570 km</li> <li>Bottom of crust shall be at least 600mm above HFL to prevent any capillary action due to black cotton/expansive/cohesive soil.</li> <li>Flexible Pavement Thickness is proposed for almost entire length with minimum design period of 20 years.</li> <li>CBR value of sub grade as per IRC guidelines.</li> <li>40mm BC with PMB-70 has been considered as surface course and 60mm DBM with VG-30 has</li> </ul>	Section 5 of the Manual of Specificatio ns and Standards and IRC:37 & IRC:58.	proposed for a minimum design period of 20 years for the carriageway and paved shoulders of entire project stretch, except Toll Plaza	damaging of pavement condition.  PT: Design Parameter's	detail design documents & drawings and comparison with site conditions	Covered under preliminary design preparation by F/S consultant  Detailed design cost to be borne by EPC Contractor	Design Consultant	PMC/RPWD-PIU-PPP

Environmental		Reference		Monitoring indicators				utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Resp Implement ation  Design Consultant	Supervision /Monitoring
1.3. Drainage provisions	been considered for Base/ binder course.  Also, Rigid Pavement thickness for small section for a design period of 30 years with PQC-M40 Grade of 300m, Dry Lean Concrete of 150mm and Granular Sub Base of 250mm.  Raised embankment and provision of roadside drainage to prevent damage to pavement due to water logging on the road and also inconvenience caused to nearby community.  Provision of adequate nos. of cross drainage structures.  Increased (vent and height) in waterway of existing structures.  Roadside drains have been proposed with suitable outfalls.  Additional culverts and bridges  Causeway and submerged bridges to be replaced with high level bridges  Roadside longitudinal	lined drain as per IRC: SP:42- 2014 & IRC: SP:50- 2013. IRC SP: 42- 2014 and IRC SP: 50- 2013. MORTH Specificatio ns for Road and Bridge	Culverts Reconstruction (9 nos. slab culverts to Box culverts, 6 nos. HPC to HPC/Box culverts) and 41 nos. of additional new HPC/ Box culverts.  Bridges Reconstruction of 6 existing minor bridges at km 25.605, km 25.856, km 26.520, km 45.831, km 47.042 and km	MI: Monitoring of the function of cross drainage, longitudinal drainages and climate adaptation during exigencies.  PT: Standard Design and required numbers of cross and side drains, slab/box culverts, and Hume pipes	detail design documents & drawings and	preparation by F/S	Consultant	PMC/RPWD-PIU-PPP
	drains to avoid water logging in built-up-		in built-up sections = 41.66 km (B/S).					

Environmental		Remedial Measure	Reference		Monitoring indicators	Manitanin	BALL of the second		utional nsibility
Issue/Componen t		Remediai Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Respondent ation  Design Consultant	Supervision /Monitoring
1.4. Safety along	•   •   •	sections and rural sections proposed with suitable outfalls. Prevention of waterlogging and overtopping due to intensive rainfall.	Design	RWH at every 2km in a staggered manner on LHS and EHS in the entire project length.  Curve locations	MI: Monitoring				PMC/RPWD-
the proposed alignment		geometrics in consistent to adequate numbers of road signs and pavement markings IRC/MORTH guidelines. Provision of crash barriers at high embankments. Speed breakers in habitat areas, schools, junction and curves to regulate speed. Provision retroreflective warning signboards, LED traffic beacons near school, hospital, religious places and forests Safety kerb at all bridges Informatory traffic signage/ Road markings on approach to built-up sections on	requiremen t IRC:8, IRC:25, IRC:26, IRC:35, IRC:67, IRC: 79, IRC: 99 IRC 119, and Section 800 of MoRTH Specificatio ns	Speed Breakers and	of the functioning/ performance of proposed safety measures, w.r.t proposed numbers, location and site-specific needs and maintenance.  PT: Required numbers and location of crash barriers, speed breakers, warning sign boards, road	design documents and drawings and comparison with site conditions	under preliminary design preparation by F/S consultant  Detailed design cost to be borne by EPC Contractor	Consultant	PIU-PPP

Environmental		Reference		Monitoring indicators				utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
	<ul> <li>Ambulance and medical aid posts</li> <li>Checking for overloading at toll plazas.</li> <li>Speed restrictions in built up sections curve locations etc.</li> <li>Roadside Safety Barriers near culverts, bridges.</li> <li>Pedestrian Guard Rails / Footpath Facilities at Schools.</li> <li>Other road safety furniture comprising road signs, road markings, object markers, hazard marker, studs, delineators, attenuators, safety barriers, pedestrian guard rails, boundary stones, kilometre stone etc.</li> </ul>		Toll Plaza = 2 Nos. at km 10.200 (Buchkallan) and at km 66.400 (Near Beetan)					
2. Natural Hazar	ds and Climate Change ris	ks			ı			I
2.1 Damage to pavement integrity like Rutting, embrittlement , softening and migration of liquid asphalt. and paved surfaces	<ul> <li>Flexible Pavement         Thickness is proposed             for almost entire             length with minimum             design period of 20             years.     </li> <li>CBR value of sub             grade as per IRC             guidelines.</li> <li>40mm BC with PMB-             70 has been</li> </ul>	IRC:37 & IRC:58 for flexible pavement design.	Entire stretch	MI: Monitoring pavement surface quality interms of roughness, cracking, rutting, softening etc.  PI:No softening, rutting, rutting, asphalt	design documents and drawings and comparison with site conditions	Covered under preliminary design cost of F/S consultant  Detailed design cost to be borne by EPC Contractor	Design Consultant	PMC/RPWD- PIU-PPP

Environmental		Reference		Monitoring indicators				utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
2.2 Flooding/ Water-	considered as surface course and 60mm DBM with VG-30 has been considered for Base/ binder course.  • Adequate number of CD structures.	IRC:34 Recommen	Reconstruction (9 nos. slab culverts to Box culverts, 6	overtopping/	design	Covered under costs	Design Consultant	PMC/RPWD- PIU-PPP
Logging	Additional culverts also proposed.  CD structures designed for 50year return period.  Water ways of bridges and culverts have been increased.  Roadside drains also provided  Embankment height raised along low lying/ potential water-logged areas.  Improvement in existing culverts through increase in vent size or retrofitting's.  Longitudinal Drains designed so that runoff resulting from storms to a specified frequency of occurrence can be drained off immediately without overflowing or not being impounded in lower level of the	dations for road construction in waterlogge d area and IRC: 75 and MORT&H guidelines for Design of High Embankme nts	km 25.856, km 26.520, km 45.831, km 47.042 and km	design, functioning and numbers in accordance with site needs.  PT: Standard Design and required numbers of cross & side drains, slab/ box culverts Hume pipes, road embankment height, design and number of	and drawings and comparison with site conditions	for DPR consultants and PPTA consultants		

Environmental	Damadial Massura	Reference to laws/		Monitoring indicators	Ba a mit a min m	B#141 41		utional nsibility
Issue/Componen t	Remedial Measure	guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
	Project Area and market areas.							
2.3 Earthquake	Relevant IS codes shall be adopted in designing the structures to sustain the magnitude of earthquake corresponding to Seismic zone of the project area	Dislodgem ent of superstruct ure shall be taken as per Clause 222 of IRC:6.	Entire Stretch	MI: Integrity of proposed structures like bridges, culverts and others.  PT: Design conforms BIS and IRC quidelines.	design documents and drawings and comparison with site	F/S consultant, Detailed design cost to be borne by concessiona ire		PMC/RPWD- PIU-PPP
2.4 Drought	Ensure water availability for compaction work and consolidation of sub- structure	IRC:78- 2000 Standard Specificatio ns and Code of Practice for Road Bridges	Entire Stretch	MI: Monitoring GW levels, public consultations with local communities.	drawings of foundations, substructure and superstructu re of structures		Design Consultant	PMC/RPWD- PIU-PPP
2.5 Forest Fires	<ul> <li>Measures to avoid accident followed by fuel spills.</li> <li>Removal of maintenance slash or management by controlled burning.</li> <li>Plant fire-resistant species in RoW</li> <li>Thinning slashing during non-dry season.</li> </ul>	requiremen t	There is no forest along proposed road.			Covered under F/S consultant cost	Design Consultant	PMC/RPWD- PIU-PPP

Environmental			Reference				Monitoring indicators				utional nsibility
Issue/Componen t	Remedial Measure		to laws/ guideline	Loca	ations		(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
	•	No construction camp within 500m of Notified Forest Areas.									
3. Loss of Land	anc	d Assets									
3.1 Livelihood loss to affected persons	•	Road improvement work to be accommodated within available ROW to the extent possible.  Minimize resettlement impact due to heavily congested built-up section  Social Impact Assessment and Resettlement Plan to be undertaken as per national policy and ADB' guidelines.	The Right to Fair Compensat ion and Transparen cy in Land Acquisition, Rehabilitati on and Resettleme nt Act, 2013 and ADB's involuntary resettlemen t policy.  Contract Clause for preference to local people during employmen t.	SIA/ F	RAP f	or more	payment of compensation and assistance to DPs as per RP.  PT: Minimal number of complaints/ grievances. No case referred to arbitrator/ court.	records; design drawings vs land plans; Interview with affected persons	administrativ e and resettlement costs	RPWD and implementin g NGO	PMC/RPWD-PIU-PPP
		per RP									

Environmental		Remedial Measure	Reference to laws/		Monitoring indicators	Monitorina	Mitigation		utional nsibility
Issue/Componen t		Kemediai Measure	guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
4. Diversion of F 4.1 Need for cutting of trees and	ore	Preference in employment and petty contracts during construction to APs Constitute GRC as per RP est Land and Cutting of Geometric adjustments to minimize tree cutting	Forest Conservati	Forest Diversion = Nil Total number of affected trees= 1, 075 Nos.		Review final design.	Covered under preliminary	RPWD, Design cousulant	PMC/RPWD- PIU
diversion of forest land	•	and diversion of forest land Obtain tree cutting permission from forest department Provision for mandatory compensatory afforestation (1:3) for deposit of payment to Forestry Department		Mandatory compensatory plantation in 1:3 ratio = 3, 225 saplings	geometric adjustments made to avoid forestland and tree cutting, budget amount allocated for compensatory afforestation and additional plantation.  PT: Avoiding or bare minimum tree felling on Govt. land/ forest/	budget provision for compensato ry afforestation Onsite validations of plantations	design preparation by F/S consultant  Detailed design cost to be borne by EPC Contractor		
5. Shifting of Uti	litid	<u> </u>			private land.				
5.1. Disruption of utility services to local community	•			Throughout the corridor	complaints from local people, number, timing	with concerned utility authorities	Included under RPWD's costs	EPC Contractor/ RPWD/utilit y company	AE/PMC/RP WD-PIU- PPP

Environmental	Domadial Massura	Reference to laws/		Monitoring indicators	Manitarina	BA:4:		utional nsibility
Issue/Componen t	Remedial Measure	guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
	be made to relevant utility service agencies to allow quick shifting and restoration of utility services  • Local people must be informed through appropriate means about the time of shifting of utility structures and potential disruption of services if any			issued to local people, time taken to shift utilities  PT: Nos. of complaints should be bare minimum or. Minimal time for utility shifting.				
B. Construction			L	<u> </u>	1	l .		l .
1. Preparatory a								
1.1 Preparatory activities	<ul> <li>Submit appointment letter and resume of the EPC Contractor's Environmental Focal Person (EFP) to PMU</li> <li>EFP will engage PMC Environment Specialist and PMU Safeguard Officer-Environment to a meeting to discuss in detail the EMP, seek clarification and recommend corresponding revisions if necessary</li> <li>EFP will prepare implementation schedule of the approved EMP, EMoP, and agreements reached during the meeting</li> </ul>	requiremen	Project Office, EPC Contractor's construction camp	MI: Check the Contract document, EMP and construction Method for proper addressing all environmental management plans.  PT: Compliance of EMP during construction activities.Approvals, attendance	accomplish ment report	Part construction cost for Contractor and PMC Contract	EPC Contractor/ RPWD- PPP-PIU	AE/PMC/RP WD-PIU- PPP

Environmental		Reference		Monitoring indicators				utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
	with PMC-ES and PMU-SOE  EFP will consult Environmental Safeguard Implementation Manual and will apply monthly monitoring formats (Checklists) and establish deadlines for submission in consultations with ES (PMC) and ES (AE).  EFP will submit for PMC-ES approval an action plan to secure all permits and approvals needed to be secured during construction stage which include but not limited to: i) operation of crushers and hot mix plants, ii) transport and storage of hazardous materials (e.g., fuel, lubricants, explosives), iii) waste disposal sites, iv) temporary storage location, iv) water use, and v) emission compliance of all vehicles.  Arrangements to link with government health programs on hygiene, sanitation,							

Environmental		Reference		Monitoring indicators		Battle and an		utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
	and prevention of communicable diseases will also be included in the action plan.  • EFP will submit for approval of PMC-ES the construction camp layout before its establishment.							
1.2 Site induction	<ul> <li>No works will be initiated by the EPC contractor until the site induction training is carried out by the PMC</li> <li>Site induction training includes but not limited to: i) discussion and review of EMP and EMoP detailing how specific environmental risks associated with their Scope of Work will be managed legal compliance, inspection and audits, and progress tracking and reporting; ii) environmental training and awareness needs shall be determined and documented via a training needs analysis prior to commencement; iii) Health and Safety Awareness Course,</li> </ul>		Conference/ Meeting Room in construction camp of EPC Contractor or any other suitable place, adequately big enough in areal size for observed required social distancing, where Audiovisual facilities for delivering training programmes, can be installed.	Training modules, participants list and number of trainings  PT:	accomplish ment report	Part construction cost for Contractor and PMC Contract	EPC Contractor/ RPWD- PPP-PIU	AE/PMC/RP WD-PIU- PPP

Environmental		Reference		Monitoring indicators		BATCH		utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
1.3 Poor siting and layout of workers camp and other infrastructure facilities	which details general environmental awareness and specific performance requirements expected on site; and iv) GRM and v) compliances to implementation of Community Occupational Safety & Health Plan (COSHP) for prevention and control of spread of COVID-19  The location, layout and basic facility provision of each labour camp and others will be submitted to (Supervision Consultant) and Project Implementing Unit (PIU) prior to their construction.  Ensure solid waste and liquid management plan subject to the review and approval of the Supervision Consultant  Camps sitting to maintain minimum distance from following:  # 500m from habitations  # 500m from water bodies	requiremen t. General Condition of	All contractors and sub-contractors	MI: Review the design Check compliance with design sitting.  PT: Confirms Camps site not disturbs the nearby habitation and main road traffic. Not to pollute receiving waterbodies.		Part construction cost for Contractor and PMC Contract	EPC Contractor/ RPWD- PPP-PIU	AE/PMC/RP WD-PIU- PPP

Environmental		Reference		Monitoring indicators		Mitigation		utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	
2. Air Quality 2.1 Dust Generation due to construction activities and transport, storage and handling of construction materials	submit location and layout plan for storage areas of construction materials agreed by PD-PPP-PIU-RPWD	ns for Road and Bridge works Air (P and CP) Act 1974- Sunsequen t Amendmen	construction activities, Human Habitation during commencement of construction activities in Chodwas, Benen,	MI: NAAQS Limits, Complaints from locals due to dust.  PT: Compliances to NAAAQS Number of complaints	s Public consultation Review of monitoring data		EPC Contractor	AE/PMC/RP WD-PIU- PPP
	workers.							

Environmental			Reference		Monitoring indicators				utional nsibility
Issue/Componen t		Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
2.2 Emission of air pollutants (HC, SO <sub>2</sub> , NO <sub>x</sub> , CO etc) from vehicles due to traffic congestion and use of equipment and machinery	•	maintenance of machinery and equipment. Batching, asphalt mixing plants and crushers at downwind (1km) direction from the nearest settlement. Only crushers licensed by the PCB shall be used. DG sets with stacks of adequate height and use of low Sulphur diesel as fuel. LPG should be used as fuel source in construction camps instead of wood Ambient air quality monitoring. Contractor to prepare traffic management and dust suppression plan duly approved by PD-PIU-PPP-RPWD after review by TL (AE).	(Prevention and Control of Pollution) Act, 1981 and applicable subsequent	Chodwas, Benen, Buchkallan, Bankaliya, Riyaan, Pipar, Uchiya Bara,	HC, SO <sub>2</sub> , NO <sub>2</sub> , and CO. Status of PUC certificates PT: Compliances to NAAQS.	CPCB methods  Review of monitoring data maintained by EPC contractor	Included in civil works cost		AE/PMC/RP WD-PIU- PPP

Environmental		Reference		Monitoring indicators				utional nsibility
Issue/Componen t	Remedial Measur	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
3. Noise and Vil	bration							
3.1 Disturbance	<ul> <li>All equipment to</li> </ul>		Throughout project section					AE/PMC/RP
to local	timely serviced				rule, 2000	civil works	Contractor	WD-PIU-
residents	properly maintain					costs		PPP
and sensitive	<ul> <li>Construction</li> </ul>	Pollution	sensitive locations as near					
receptors	equipment	and (Regulation	schools viz; km 8.040 (LHS),		"Criteria for			
due to	machinery to be	fitted and	km 8.199 (LHS), km 8.689		measuring			
excessive	with silencers		(RHS), km 13.550 (LHS), km	people	and			
noise from	maintained prope	rly. Rules, 2000			assessing			
	<ul> <li>Only IS appr</li> </ul>	oved and	(RHS), km 17.152 (RHS), km					
activities and	equipment shall	be amendmen	20.000 (LHS), km 29.200		of vibration			
operation of	used for constru		(LHS), km 41.894 (RHS), km		on			
equipment	activities.	thereof	47.399 (RHS), km 50.900		buildings"			
and		noisy +	(RHS), km 51.800 (RHS), km					
machinery	construction activ		55.096 (LHS), km 62.300		DIN 4150			
	shall be done d	uring 501.8.6.	(RHS), km & 84.399 (LHS).	and night time	BS 7385			
	night time	and MORT&H		noise levels	_			
	weekend	near Specificatio			Consultation			
	schools,	ns for	construction activities in	•	with local			
	Implement	noisy Road and			people			
	operations	Bridge	Buchkallan, Bankaliya,	zone areas				
	intermittently	to works	Riyaan, Pipar, Uchiya Bara,		Review of			
	reduce the total r	noise DIN 4150			noise level			
	generated	and BS			monitoring			
	<ul> <li>Manage existing t</li> </ul>	raffic 7385.	Indawar, Satlawas and Merta		data			
	to avoid traffic	jams	City.		maintained			
	and accumulatio	n of			by			
	noise be	yond			contractor			
	standards.				01 "			
	<ul> <li>Restrict constru</li> </ul>	ction			Observation			
	near residential,	built			of			
	up and forest a	areas			construction			
	construction to	day			site			
	light hours.	-						
	<ul> <li>Conduct cond</li> </ul>	ition						
	surveys of	all						
	properties within	25						

Environmental		Reference		Monitoring indicators				utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
4. Land and Soi 4.1 Land use Change and Loss of productive / topsoil	meters from road edge  Vibration monitoring during heavy machinery/ equipment operation  Honking restrictions near sensitive areas.  PEs to workers  Noise monitoring as per EMoP.  Il  Non-agricultural areas to be used as borrow areas to the extent possible.  If using agricultural land, top soil to be preserved and laid over either on the embankment slope for growing vegetation to protect soil erosion.  Land for temporary facilities like construction camp, storage areas etc. shall be brought back to its original land use	Project requiremen t, applicable ADB and IRC	Throughout the project section and borrow areas Land identified for camp, storage areas etc.	MI: Borrow pit locations/Top soil storage area, Compliances with applicable ADB and IRC Guidelines.  PT: Zero complaints or disputes registered against contractor by land owner	borrow area plan, site visits		EPC Contractor	AE/PMC/RP WD-PIU- PPP
4.2 Slope failure and Soil erosion due to Construction activities, earthwork, and cut and		practice for treatment of embankme	Throughout the entire project road for example retaining walls/ toe walls are proposed for 1.1 km at 3 ponds sections from km 40.850 to km 41.050 (RHS), km 42.900 to km 43.250 (B/S) and km 52.710 to km 52.910 (RHS).	Occurrence of slope failure or erosion issues.  PT: No slope	documents and site observation		EPC Contractor	AE/PMC/RP WD-PIU- PPP

Environmental		Reference		Monitoring				utional
Environmental Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	nsibility Supervision /Monitoring
fill, stockpiles etc.		control Clause No. 306 and 305.2.2 MORT&H Specificatio ns for Road and Bridge works Guidelines IX for Soil erosion		Minimal erosion issues				
4.3 Borrow area management	Non-productive, barren lands, upland shall be used for borrowing earth with	on borrow areas and for quarries (Environme ntal protection Act and Rules, 1986; Water Act, Air Act) +	Borrow Area sites		Review of design documents and site observations		EPC Contractor	AE/PMC/RP WD-PIU- PPP

Environmental	5	Reference		Monitoring indicators				utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
	<ul> <li>location, its operation and rehabilitation</li> <li>Borrow areas not to be dug continuously.</li> <li>To the extent borrow areas shall be sited away from habitat areas.</li> <li>Borrow areas shall be levelled with salvaged material or other filling materials which do not pose contamination of soil. Else, it shall be converted into fish pond.</li> <li>EPC Contractor to submit copies of STPs/ Land Owners Consent Letters.</li> </ul>	IRC Guidelines for Borrow Areas manageme nt		Zero accidents. Zero complaints No use of black cotton soil				
4.4 Quarry Operations	<ul> <li>Aggregates will be sourced from existing licensed quarries.</li> <li>Copies of consent/ approval / rehabilitation plan for a new quarry or use of existing source will be submitted to RPWD.</li> <li>The contractor will develop a Quarry Redevelopment plan, as per the Mining Rules of the state and</li> </ul>	MORT&H Specificatio ns for Road and Bridge works Guidelines VI for Quarry Areas Manageme nt	New Quarry if needed and existing Quarries	of licenses quarry areas from which materials to be sourced and Existence of a quarry redevelopmen t plan  PT: Quarry	design documents, contractor documents and site observation Compliance to EC conditions in case of opening new quarries	civil works cost	EPC Contractor	AE/PMC/RP WD-PIU- PPP

Environmental		Reference		Monitoring indicators				utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
	submit a copy of the approval to EA.  Obtain environmental clearance from SEIAA /DEIAA in case of opening new quarry.	Rules		consent conditions and air quality meets the prescribed limit			_	
4.5 Compaction of soil and impact on quarry haul roads due to movement of vehicles and equipment	<ul> <li>Construction vehicles, machinery, and equipment to be stationed in the designated ROW to avoid compaction.</li> <li>Approach roads/haulage roads shall be designed along the barren and hard soil area to reduce the compaction.</li> <li>Transportation of quarry material to the dumping site through heavy vehicles shall be done through existing major roads to the extent possible to restrict wear and tear to the village/minor roads.</li> <li>Land taken for construction camp and other temporary facility shall be restored to its original conditions.</li> </ul>	Design requiremen t	Parking areas, Haulage roads and construction yards.	MI: Location of approach and haulage roads Presence of destroyed/com pacted agricultural land or land which has not been restored to its original condition.  PT: Zero occurrence of demolished/compacted land and undemolished land.			EPC Contractor	AE/PMC/RP WD-PIU- PPP
4.6 Contaminati on of soil due	Construction vehicles and		Fuelling station, construction sites, and construction	soil near	Site observation	civil work	EPC Contractor	AE/PMC/RP WD-PIU-
to leakage/ spillage of	equipment will be maintained and	t	camps and disposal location.	storage area		cost.		PPP

Environmental		Reference		Monitoring indicators				utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline		(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
oil, bituminous and non- bituminous debris generated from demolition and road construction	refuelled in such a fashion that oil/diesel spillage does not contaminate the soil.  Fuel storage and refuelling sites to be kept away from drainage channels.  Unusable debris shall be dumped in ditches and low-lying areas.  To avoid soil contamination Oil-Interceptors shall be provided at wash down and refuelling areas.  Waste oil and oil-soaked cotton/ cloth shall be stored in containers labelled 'Waste Oil' and 'Hazardous' sold off to MoEF/SPCB authorized vendors  Non-bituminous wastes to be dumped in borrow pits with the concurrence of landowner and covered with a layer of topsoil conserved from opening the pit.  Bituminous wastes will be disposed off in an identified dumping site approved by the State Pollution Control Board.		2 Nos. of Oil interceptors are proposed at the proposed two Truck-lay-by locations at km 20.450 and km 58.100.	spilled oil or				

Environmental			Reference		Monitoring indicators				utional nsibility
Issue/Componen t		Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
5. Water Resou	rce								
5.1 Sourcing of water during Construction	•	Requisite permission shall be obtained for abstraction of groundwater from Central Groundwater Authority.  Arrangements shall be made by EPC contractor that the water availability and supply to nearby communities remain unaffected.  Water intensive activities not to be undertaken during summer season.  Provision of water harvesting structure to augment recharging of groundwater conditions (aquifers) in the project area.  Permissions from Local Irrigation Department, in case using canal water.	CGWA Guidelines	Throughout the Project section  All water harvesting structures and at toll plazas.	from competent authority Complaints	Checking of documentati on.  Talk to local people		EPC Contractor	AE/PMC/RP WD-PIU- PPP
	•	Agreement letters with local level water suppliers.							
5.2 Disposal of water during construction	•	Provisions shall be made to connect road	No.1010 EP Act,	Throughout the Project section.	of drainage system in construction site. Presence	methods Site observation	Included in civil work cost	EPC Contractor	AE/PMC/RP WD-PIU- PPP

Environmental		Reference		Monitoring indicators				utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
		ns for Road and Bridgework s		water logging in project area.  PT: Existence of proper drainage system. No water logging in project area				
5.3 Alteration in surface water hydrology	maintained and further enhanced.	requiremen t, Clause No 501.8.6. MORT&H Specificatio ns for Road and Bridge	near waterways at km 27.124, km 30.954, km 25.605, km 25.856, km 26.520, km 45.831, km 47.042, km 47.603 and ponds at section from km	of water in existing streams and rivers  PT: No complain of water shortage by			EPC Contractor	AE/PMC/RP WD-PIU- PPP

Environmental		Reference		Monitoring indicators				utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
5.4 Siltation in water bodies due to construction activities / earthwork	suitably to restrict the soil debris entering water bodies.	requiremen t, Clause No 501.8.6. MORT&H Specificatio ns for Road and Bridgework s Worldwide best practices	25.856, km 26.520, km 45.831, km 47.042, km 47.603 and ponds at km 40.850, km 42.900, km	MI: Presence /absence of siltation in	Field observation	Included in civil works cost	EPC Contractor	AE/PMC/RP WD-PIU- PPP
5.5 Deterioratio n in Surface water quality due to leakage from vehicles and equipment	<ul> <li>No vehicles or equipment should be parked or refuelled near water-bodies, so as to avoid contamination from fuel and lubricants.</li> <li>Oil and grease traps and fuelling platforms</li> </ul>	(Prevention and Control of Pollution) Act, 1974 and amendmen ts thereof. /	30.954, km 25.605, km 25.856, km 26.520, km 45.831, km 47.042, km 47.603 and ponds at section from km 40.850 to km 41.050 (RHS), km 42.900 to km 43.250 (B/S) and km 52.710 to km 52.910 (RHS),	quality of ponds, streams, rivers and other water bodies in project. Presence of oil	monitoring plan	Included in civil works cost	EPC Contractor	AE/PMC/RP WD-PIU- PPP

Environmenta	al		Reference		Monitoring indicators				utional nsibility
Issue/Compon t		Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
and waste		to be provided at		construction camps,					
from		refuelling locations.	2	proposed Truck-lay-bye					
construction	on '	<ul> <li>All chemicals and oil</li> </ul>		locations at km 20.450 and					
camps.		shall be stored away		km 58.100.	meets				
		from water and concreted platform			freshwater quality				
		concreted platform with catchment pit for			standards				
		spills collection.			prescribed by				
	١,	<ul> <li>All equipment</li> </ul>			CPCB.				
		operators, drivers,							
		and warehouse							
		personnel will be							
		trained in immediate							
		response for spill							
		containment and							
		eventual clean-up.							
		Readily available, simple to understand							
		and preferably							
		written in the local							
		language emergency							
		response procedure,							
		including reporting,							
		will be provided by							
		the contractors.							
	'	<ul> <li>Construction camp to</li> </ul>							
		be sited away from water bodies.							
	'	<ul> <li>Wastes must be collected, stored and</li> </ul>							
		taken to approve							
		disposal site only.							
	.	<ul> <li>Water quality shall be</li> </ul>							
		monitored.							
6. Flora and									
6.1 Vegetation		<ul> <li>Restrict tree cutting</li> </ul>	Forest	Throughout project corridor.			Mandatory	Mandatory	AE/PMC/RP
loss due to	)		Conservati		width. Number		Compensato		WD-PIU-
site		considering safety to					ry	ory	PPP
		road users.	+	tree = 1, 075 Nos.	felling.	of tree	afforestation	piantation	

Environmental			Reference			Monitoring indicators				utional nsibility
Issue/Componen t		Remedial Measure	to laws/ guideline	Locations		(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
preparation	•								by forest	
and		removed with prior	and IRC:		nsatory	plantation	permit,		Department	
construction		• •	SP:66	plantation in 1:3 rat	io = 3,	plan. Number		project costs		
activities		competent authority.		225 saplings			J	under	additional	
	•	Mandatory				replanted.		RPWD.	plantation	
		compensatory		Overell Contractor	المطم	PT:	additional	۸ ماماند: م.م.م.ا	by EPC	
		plantation at 1:3		Overall, Contractor plant at least 8, 000 s			plantation	Additional	Contractor	
		basis by Forestry		•	nsatory	afforestation	Field	compensato		
		Department		afforestation.	i isatoi y	done on a 1:3		ry afforestation		
	•	Additional plantation on 1:3 basis as per		anorostation.		basis by	observations	, if required,		
		the IRC guidelines to				concessionair		costs		
		be carried out by				e.		included in		
		concessionaire						civil works		
	•	Regular maintenance						costs		
		trees planted.								
	•	Provision of LPG in								
		construction camp as								
		fuel source to avoid								
		tree cutting.								
	•	Plantation of trees on								
		both sides of the road								
		where technically								
		feasible. Trees								
		should be offset 1m								
		back from the								
		ultimate edge of the								
		roadway to prevent								
		safety hazard and provide adequate								
		sight distance.								
	•	Integrate vegetation								
	•	management (IVM)								
		with the carriage way								
		completely clear of								
		vegetation.								
	•	Controlled use of								
		pesticides/ fertilize								

Environmental	5 "	Reference		Monitoring indicators				utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
7. Construction	n Camps							
7.1 Impact associated with location	All camps should be established with prior permission from PCB. Camps to maintain minimum distance from following:     #500m from habitation     #500m from forest areas where possible     #500 m from water bodies where possible     #500m from through traffic route     #500m from identified wildlife	Requireme nt As identified in IEE, all applicable laws, rules and regulations including Contract	Construction camp	MI: Location of campsites and distance from habitation, forest areas, water bodies, through traffic route and construction camps.  PT: Distance of campsite is less than 500m from listed locations	observation Interaction with workers and local		EPC Contractor	AE/PMC/RP WD-PIU- PPP
7.2 Worker's Health in construction camp	provision of each labour camp will be submitted to AE and approved by PD-PIU-PPP-RPWD. The EPC contractor will maintain necessary living accommodation and ancillary facilities in	Building and Other Constructio n workers (Regulation of Employmen t and Conditions of service) Act 1996 and The Water (Prevention and Control	All construction camps.	health records, Compliance to SOPs of	Site observation  Consultation with contractor workers and local people living nearby	Part of the civil works costs	EPC Contractor	AE/PMC/RP WD-PIU- PPP

Environmental	Remedial Measure		Reference		Monitoring indicators	Manitarina	Mitigotics		utional nsibility
Issue/Componen t		Remediai Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
	•		amendment		cases of STD.				
		facilities in camp	S		Clean and tidy				
	•	Waste disposal	thereof		camp site conditions.				
		facilities such as dust bins must be			Compliance to				
		bins must be provided in the			SOPs of				
		camps and regular			COSHP for				
		disposal of waste.			COVID-19				
	•	The EPC Contractor			Protection.				
		will take all							
		precautions to							
		protect the workers							
		from insect and pest							
		to reduce the risk to							
		health. This includes							
		the use of insecticides which							
		should comply with							
		local regulations.							
	•	No liquor or							
		prohibited drugs will							
		be imported to, sell,							
		give and barter to the							
		workers of host							
		community.							
	•	Awareness raising to							
		immigrant workers/local							
		community on							
		communicable and							
		sexually transmitted							
		diseases.							
	•	Compliance to SOPs							
		of COSHP for							
		COVID-19							
		Protection.							
8. Management	of	Construction Waste/De	bris						

Environmental			Reference				Monitoring indicators				utional nsibility
Issue/Componen t		Remedial Measure	to laws/ guideline		Locations	3	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
8.1 Selection of Dumping Sites	•	leachate seepage into the soil, which	Requireme nt, MORT&H guidelines and General Conditions of Contract Document, Constructio n and Demolition Waste Manageme nt Rules- 2016 and subsequent Amendmen ts.	At all Sites	Dumping/	Disposal	MI: Location of dumping sites	and interaction with local people. Review of consent letter	Included in civil works cost.	EPC Contractor	AE/PMC/RP WD-PIU- PPP
8.2 Reuse and disposal of construction and	•	In the existing bitumen surface shall be utilized for paving of cross roads, access roads, and paving works in construction sites and camps,	Requireme nt, MORT&H guidelines and	Throug corridor	hout the	project	MI: Percentage of reuse of existing surface material		Included in civil works cost.		AE/PMC/RP WD-PIU- PPP

Environmental		Reference		Monitoring indicators				utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
dismantled		Conditions			Interaction			
dismantled waste	diversions, and haulage routes.  • All excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling	of Contract Document  Constructio n and Demolition Waste Manageme nt Rules 2016 and subsequent Amendmen		Method and	with local			
	be removed and disposed off-site.							
9. Traffic Manag	gement and Safety			<u> </u>	<u> </u>		<u> </u>	

Environmental			Reference		Monitoring indicators				utional nsibility
Issue/Componen t		Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
9.1 Manageme nt of existing traffic and safety	•	time traffic and precautions for transportation of hazardous materials. Timing and scheduling to be done so that transportation of dangerous goods is	requiremen t and IRC: SP: 27 -1984, Report Containing Recommen dation of IRC Regional Workshops on Highway Safety IRC: SP: 32 -1988 Road Safety for Children (5-12 Years Old) in Construction Zones IRC: SP:55-2014  The Building and other Construction workers Act 1996 and Cess	school, hospitals and religious places.	management plan. Presence/ absence of safety signs, traffic demarcations, flag men etc. on site. Complaints from road users. No of accidents.	system Checklists based monitoring Interaction with people in vehicles using the	Included in civil works cost.		AE/PMC/RP WD-PIU- PPP

Environmental	 Reference		Monitoring indicators				utional nsibility
Issue/Componen t	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
9.2 Pedestrians , animal movement	Same as above	Near habitation on both sides of schools, temples, construction sites, haulage roads, diversion sites.	absence of	observation Interaction with local people		EPC Contractor	AE/PMC/RP WD-PIU- PPP

Environmental		Reference to laws/		Monitoring indicators				utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
9.3 Safety of	structures having vertical clearance above 2m and not catering to perennial flow of water may serve as underpass for animals.  Contractorsto adopt and maintain safe		Construction sites	MI: Availability of Safety gears		Included in civil works	Obligation of EPC	AE/PMC/RP WD-PIU-
Workers and accident risk from construction activities	<ul> <li>and maintain sale working practices.</li> <li>Usage of fluorescent and retro refectory signage, in local language at the construction sites</li> <li>Training to workers on safety procedures and precautions.</li> <li>Mandatory appointment of safety officer.</li> <li>All regulations regarding safe scaffolding, ladders, working platforms, gangway, stair wells, excavations, trenches and safe means of entry and egress shall be complied with.</li> <li>Provision of PPEs to workers.</li> <li>Provision of a readily available first aid unit including an adequate supply of</li> </ul>			to workers. Safety signage Training records on safety.	Review records on safety training and accidents  Interact with construction	COST	Contractor	PPP

Environmental	B Pal Marana	Reference		Monitoring indicators	<b>8.8 *4 *</b>	Bard's and a se		utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
	<ul> <li>The contractor will not employ any person below the age of 18 years</li> <li>Use of hazardous material should be minimized and/or restricted.</li> <li>Emergency plan (to be approved by engineer) shall be prepared to respond to any accidents or emergencies.</li> <li>Accident Prevention Officer must be appointed by the contractor.</li> </ul>							
9.4 Accident risk to local community	<ul> <li>Restrict access to construction sites only to authorized personnel.</li> <li>Physical separation must be provided for movement of vehicular and human traffic.</li> <li>Adequate signage must be provided for safe traffic movement Provision of temporary diversions and awareness to locals before opening new construction front</li> <li>on and rehabilitation</li> </ul>	Same as above	Construction sites Sidewalks and pedestrian zones near constricted market areas and semi urban areas, habitations, haulage roads, diversion sites, sensitive receptors like schools, hospitals, temples etc.	signs and their location. Incidents of accidents.	inspection  Consultation with local people	Included in civil works cost	EPC Contractor	AE/PMC/RP WD-PIU- PPP

Environmental	Dame dial Massum	Reference		Monitoring indicators	Manitanina	B#141 41		utional nsibility
Issue/Componen t	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
1.1 Clean-up Operations, Restoration and Rehabilitatio n	<ul> <li>Contractor will prepare site restoration plans, which will be approved by the AE.</li> <li>The clean-up and restoration operations are to be implemented by the contractor prior to demobilization.</li> <li>All construction zones including river-beds, culverts, road-side areas, camps, hot mix plant sites, crushers, batching plant sites and any other area used/affected by the project will be left clean and tidy, to the satisfaction of the Environmental Specialist (PMC), Environmental Specialist (AE) and Environmental Focal Person (EPC Contractor).</li> <li>All the opened borrow areas will be rehabilitated and 'AE' will certify to satisfaction.</li> </ul>	Project requiremen t	Throughout the project corridor, construction camp sites and borrow areas	borrow areas and construction sites, Presence/	observation Interaction with locals Issue completion certificate after restoration	Included in civil works cost.	EPC Contractor	AE/PMC/RP WD-PIU- PPP

C. Operation and Maintenance stage

1. Air Quality

Environmental			Reference		Monitoring indicators				utional nsibility
Issue/Componen t		Remedial Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
1.1 Air pollution due to due to vehicular movement	•	Roadside tree plantations shall be maintained at least with 70% survival rate.  Regular maintenance of the road will be done to ensure good surface condition  Ambient air quality monitoring. If monitored parameters exceeds prescribed limit, suitable control measures must be taken.  Signages shall be provided reminding them to properly maintain their vehicles to economize on fuel consumption.  Enforcement of vehicle emission rules in coordination with transport department or installing emission checking equipment.  Obtaining of Pollution Under Control Certificates (PUCs) and their	Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981, Motor Vehicles Act 1948 and subsequent Amendmen	construction activities in Chodwas, Benen,	MI: Ambient air quality (PM <sub>10</sub> , CO, SO <sub>2</sub> , NO <sub>2</sub> )  PT: Levels are equal to or below baseline levels given in	CPCB requirement s	Included in Operation / Maintenanc e cost	Implementa tion by EPC Contractor and Supervision & monitoring by AE/PMC/R PWD-PIU-PPP	AE/PMC/RP WD-PIU- PPP
		renewal on periodic basis.							

Environmental			Reference		Monitoring indicators				utional nsibility
Issue/Componen t	Remedial Me	easure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	Supervision /Monitoring
2. Noise									
2.1 Noise due to movement of traffic	20 km/ho honking renear receptors  • Monitoring Performand Noise constructed New Construction of New Construction	riding shall be litation to our and estrictions sensitive of the sensitive of Barriers of and ruction of required liers near receptors of local wareness the about se levels operation different the safe pise limits lay to noise measures tructing a	Pollution (Regulation and Control) Rules, 2000 and amendment	Residential and sensitiv locations near schools viz km 8.040 (LHS), km 8.19 (LHS), km 8.689 (RHS), kr 13.550 (LHS), km 13.70 (RHS), km 14.201 (RHS), km 20.00 (LHS), km 29.200 (LHS), km 29.200 (LHS), km 47.39 (RHS), km 50.900 (RHS), km 51.800 (RHS), km 55.09 (LHS), km 62.300 (RHS), kr 84.399 (LHS).  Human Habitation during commencement construction activities in Chodwas, Bener Buchkallan, Bankaliya Riyaan, Pipar, Uchiya Bara Nanan, Maadaliya, Gad Sooriya, Borunda, Beetar Indawar, Satlawas and Merticity.	PT: Levels are equal to or below baseline levels given in the IEE report.	Discussion with people	Operation /	Implementa tion by EPC Contractor and Supervision & monitoring by AE/PMC/R PWD-PIU-PPP	AE/PMC/RP WD-PIU- PPP
3. Land and So		П				T =	T		
3.1 Soil erosion at embankmen	the effectiv	to assess	requiremen	At bridge locations an embankment slopes an other probable soil erosio areas.			Included in Operation / Maintenanc e cost	Implementa tion by EPC Contractor and	AE/PMC/RP WD-PIU- PPP

Environmental	Pemedial Measure	Reference		Monitoring indicators	<b>8.8</b> '4'	Bard'		utional nsibility
Issue/Componen t	Remediai Measure	to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implement ation	
t during heavy rainfall.	measures viz. turfing, stone pitching, river training structures etc.  Necessary measures to be followed wherever there are failures			Number of soil erosion sites  PT: Zero or minimal occurrences of soil erosion.			Supervision & monitoring by AE/PMC/R PWD-PIU- PPP	
4. Water resour	ces/ Flooding and Inundat	ion			I			I
4.1. Siltation	Regular checks shall be made for soil erosion conditions for its effective maintenance.	Project requiremen t	26.520, km 45.831, km 47.042, km 47.603 and ponds at section from km 40.850 to km 41.050 (RHS), km 42.900 to km 43.250 (B/S) and km 52.710 to km 52.910 (RHS).	quality.  PT: No turbidity of surface water bodies due to the road.	observations	Maintenanc e cost	tion by EPC Contractor and Supervision & monitoring by AE/PMC/R PWD-PIU- PPP	PPP
4.2 Water logging due to blockage of drains, culverts or streams	<ul> <li>Regular visual checks and cleaning (at least once before monsoon) of drains to ensure that flow of water is maintained through cross drains and other channels/streams.</li> <li>Monitoring of water borne diseases due to stagnant water bodies</li> </ul>		Near surface water bodies/ cross drains/ side drains locations.			Included in Operation / Maintenanc e cost	Implementa tion by EPC Contractor and Supervision & monitoring by AE/PMC/R PWD-PIU- PPP	AE/PMC/RP WD-PIU- PPP

Environmental	Remedial Measure	Reference to laws/		Monitoring indicators	Manitarina	Mitigation		utional nsibility
Issue/Componen t	Remediai Measure	guideline	Locations	(MI)/ Performance Target (PT)	Monitoring Methods	Costs	Implement ation	Supervision /Monitoring
5.1 Vegetation	<ul> <li>Planted trees, shrubs, and grasses to be properly maintained.</li> <li>The tree survival audit to be conducted at least once in a year to assess the effectiveness</li> </ul>	Forest Conservati on Act 1980	Project tree plantation sites	MI: Tree/plants survival rate PT: Minimum rate of 70% tree survival.	field observations . Information	Included in Operation / Maintenanc e cost	Implementa tion by EPC Contractor and Supervision & monitoring by AE/PMC/R PWD-PIU- PPP	AE/PMC/RP WD-PIU- PPP
6. Maintenance	of Right of Way and Safet	<u> </u> V						
6.1 Accident Risk due to uncontrolled growth of vegetation	<ul> <li>Maintain shoulder completely clear of vegetation.</li> <li>Minimum offset as prescribed in IRC: SP:21-2009 to be maintained</li> <li>Regular maintenance/ trimming of plantation along the road side</li> <li>No invasive plantation near the road sides</li> </ul>	Project requiremen t IRC: SP:21- 2009	route.	either side of road. Number of accidents.  PT: No accidents due to vegetation growth.	inspection Check accident records	Operation / Maintenanc e cost	Implementa tion by EPC Contractor and Supervision & monitoring by AE/PMC/R PWD-PIU- PPP	PPP
6.2 Accident risks associated with traffic movement.			Throughout the Project route especially at accident prone areas at major 4-arm junctions' locations viz; km 9.340, km 13.525, km 17.100, km 26.030 (Near school), km 62.160, km 67.050, km 78.140 and km 86.480 etc.	accidents Conditions and existence of safety signs, rumble strips etc. on the	accident records Site observations	Included in Operation / Maintenanc e cost	Implementa tion by EPC Contractor and Supervision & monitoring by AE/PMC/R	AE/PMC/RP WD-PIU- PPP

Environmental		Remedial Measure	Reference to laws/			Monitoring indicators	Monitoring	Mitigation		utional nsibility
Issue/Componen t		Remedial Measure	guideline	Locations		(MI)/ Performance Target (PT)	Methods	Costs	Implement ation	Supervision /Monitoring
	•	Monitor/ensure that all safety provisions included in design and construction phase are properly maintained Highway patrol unit(s) for round the clock patrolling. Phone booth for accidental reporting and ambulance services with minimum response time for rescue of any accident victims, if possible. Tow-way facility for the breakdown vehicles if possible. Road Safety Audit should be conducted on regular basis				sensitive receptor structures inside the stipulated planning line as per relevant local law  PT: Fatal and non-fatal accident rate is reduced after improvement.			PWD-PIU- PPP	
6.3 Transport of Dangerous Goods	•	Existence of spill prevention and control and emergency responsive system Emergency plan for vehicles carrying hazardous material	OHS Standards/ Material Safety Data Sheet (MSDS)	Throughout the stretch	project	MI: Status of emergency system – whether operational or not  PT: Fully functional emergency system	spill prevention and emergency response plan	Included in Operation / Maintenanc e cost	Implementa tion by EPC Contractor and Supervision & monitoring by AE/PMC/R PWD-PIU- PPP	

Environm	ontol	Domodial Mass		erence laws/		indic	ators	Manie	toring	Mitian	4:	ı	Respor	sibility
Environm Issue/Comp	ponent	Remedial Measu		deline	Locations	(M Perfori Targe	mance		toring hods	Mitiga Cos		Imple	menta on	Supervision /Monitorin
		struction Stage												
1. Alignment/ P 1.1. Alignment		osed design adopted	Section 2	Wido	ning of whole project	MI	Povio	w of	Covere	24	Desig	ın	PMC/	D D\M
Design	in ac provis IRC MoRT AASH Geon stand follow  2-Lai  1 C	cordance with the ions of the following and BIS Codes/ H guidelines/ ITO specifications.  The guidelines/ ITO specificatio	of the Manual of Specificati ons and Standards for Two Lanning of Highways with Paved Shoulder (IRC: SP:73-2018)	road 86/70 shall alignr defici and shall availa preso Raisii of en where to les Realie from and 42.95 Realie (km 43.53.45 55.15	from km 0/000 to 00 (Length 86.700 km) follow the existing ment unless geometric encies with horizontal vertical profiles which be corrected within able RoW as percribed standards.  In and reconstruction and and the road top level is equal to the standards than HFL or Bypass/gnment sections.  Sees=2 Nos. (Sections km 29.600 to 31.400 km 41.950 to km	Recording of near miss, incident, accident, safety parameters etc w.r.t to designed alignment.  PT: Design in compliance to prescribed Standards.  MI: Design Parameter's compliance to prescribed Standards.  PT: Designs are in accordance with site requirement s	detail desigr docun	n nents wings arison site	under prelimin design prepara by consult Detaile design	nary ation F/S tant ed cost to rne by	Cons		D-PIU	

Reference

Monitoring

indicators (MI)/

Institutional

Environmental	Remedial Measu		erence aws/			Monito indica	tors	Monit	oring Mitic	ation		Institu Respon		1
Issue/Component			deline	Locations		(MI) erform Target	nance	Meth		sts	Imple		Super /Monit	
avement esign  avement esign  Bo at HF cap bla exp soi Flee Th for wit per cas 400 has sui 600 has for Als thic	Carriageway Width = 7.5m each with 1.5m Median. Paved Shoulder Width = 2 x 1.5m, Paver Block Shoulder Width = 2 x 2.0m or varying width shoulder. Side Drain = 2 x 1.5m footpath drain Roadway Width = 30.0m (Approx.) Roadway Length = 18.570 km ttom of crust shall be least 600mm above EL to prevent any pillary action due to lock cotton/pansive/ cohesive ill. Exible Pavement ickness is proposed almost entire length the minimum design riod of 20 years. BR value of sub grade per IRC guidelines.	Section 5 of the Manual of Specificati ons and Standards and IRC:37 & IRC:58.	designate care the care should stretch Section Paver	sed for a minimum period of 20 years for arriageway and paved ders of entire project h, except Toll Plaza ons where Rigid ment shall be provided design period of 30	MI: Monitori of we and damagii paveme conditio PT: Des Parame complia to prescrib Standar	aring of ent n. sign ter's nce	Reviev detail desigr docum & dra and compa with condit	n nents wings arison site	Covered under preliminary design preparation by F/S consultant  Detailed design cost to be borne by EPC Contractor	5	gn ultant	PMC/I D-PIU		

Environi Issue/Con	nponent	Remedial Measu	ıre to	erence laws/ deline	Locations	(M Perfor	ators		toring nods	Mitiga Cos		Respor nenta	itional nsibility Superv /Monit	/ision
1.3. Drainage provisions	PQu 3000 Corr and of 2    Raii and road prever pave logger also cau correct pave logger also cau correc	ncrete of 150mm I Granular Sub Base 250mm. sed embankment I provision of dside drainage to vent damage to venent due to water ging on the road and	Provision of lined drain as per IRC: SP:42-2014 & IRC: SP:50-2013.  IRC SP: 42-2014 and IRC SP: 50-2013.  MORTH Specificati ons for Road and Bridge Works 5th Revision 2013	Culve Reco culve nos. culve additi culve  Bridg Reco minor km 2 45.83 47.60 1 no bridge at km respe Longi togetl Footp drains 41.66  RWH stagg and	nstruction (9 nos. slab rts to Box culverts, 6 HPC to HPC/Box rts) and 41 nos. of lonal new HPC/ Box rts.  ges nstruction of 6 existing r bridges at km 25.605, 5.856, km 26.520, km 81, km 47.042 and km 93.  b. each New major e and new minor bridge 127.124 and km 30.954 ectively.  litudinal drains (B/S her)	MI: Monitoring of the function of cross drainage, longitudinal drainages and climate adaptation during exigencies.  PT: Standard Design and required numbers of cross and side drains, slab/ box culverts, and Hume pipes	and compa with	n ments awings arison site		nary ation F/S tant ed cost to rne by	Design	PMC/ D-PIU		

Environm Issue/Comp		Remedial Measu	ıre to	erence laws/ ideline	Locations	Monite indica (M Perforr Targe	ators I)/ mance		toring hods	Mitiga Cos		Imple		utional nsibility Superv /Monite	vision
1.4. Safety along the proposed alignment	Ver geo con nun and mai guid     Pro barreml     Spe hab jund reg Pro refle sigr bear hos plad     Saf brid     Info sigr mai	rkings IRC/MORTH delines. vision of crash riers at high bankments. eed breakers in vitat areas, schools, ction and curves to ulate speed. vision retrosective warning aboards, LED traffications near school, pital, religious des and forests	Design requireme nt IRC:8, IRC:25, IRC:26, IRC:35, IRC:67, IRC: 79, IRC: 99 IRC 119, and Section 800 of MoRTH Specifications	Spee signal beack facilit and school sensi Road mark etc sconsi Engir Meta provious and locati approbidg consi Engir Road barrie finaliz Author Toll I 10.20	ges, LED traffic ons, Pedestrian ies near built-up areas toll plaza and near ol, hospitals and other tive areas.  Studs, Road signs, ings, object Markers shall be finalized in ultation with Authority's neer.  I beam crash barriers ded at embankment e 3m, at sharp curve along retaining wall ons and on baches to structures, es, and culverts in ultation with Authority	MI: Monitoring of the functioning/ performance of proposed safety measures, w.r.t proposed numbers, location and site-specific needs and maintenanc e.  PT: Required numbers and location of crash barriers, speed breakers, warning sign boards, road studs, object markers etc	Review design docum and drawing and compa with condition	ents gs rison site	by consu Detail desig	ninary n ration F/S ultant ed n cost to orne by	Desig	in ultant	PMC/ D-PIL		

Environme Issue/Comp		ial Measure		rence aws/ eline	Locations	Monit indica (M Perforr Targe	ators I)/ mance	Monit Meth		tigation Costs		sibility	vision
	plazas.  Speed restrict built up section locations etc.  Roadside Barriers near bridges.  Pedestrian Gua / Footpath Fac Schools.  Other road furniture coroad signs, markings, markers, marker, delineators, attenuators, barriers, peguard rails, b stones, kilomet etc.	for at toll tions in as curve Safety culverts, and Rails cilities at safety mprising road object hazard studs, safety edestrian coundary are stone											
2. Natural Hazards 2.1 Damage to pavement integrity like Rutting, embrittlement, softening and migration of liquid asphalt. and paved surfaces		avement II proposed II propose	RC:37 & RC:58 for lexible pavement design.	Entire	stretch	MI: Monitoring pavement surface quality interms of roughness, cracking, rutting, softening etc.	Revied design document and drawing and compart with condit	n ments ngs arison site	Covered under preliminary design cos of F/3 consultant  Detailed design cos to be borne by EP0 Contractor	t t	PMC/RPV D-PIU-PF		

Environr	n antal	Remedial Measu		erence			onitorin ndicator	e l	o vin a	N/!4!	<b>vo4i</b> o :-		Institu Respor	
Issue/Com		Remediai weasu		laws/ deline	Locations		(MI)/ rforman arget (P				gation osts	Imp	lementa tion	ervision nitoring
2.2 Flooding/ Water-Logging	Adde CD Adde pro     CD for per     Wa and inci     Roa pro     Em rais pot are     Imp culvinci retr     Lor des res a spoce dra with not	equate number of structures. ditional culverts also posed. structures designed 50 year return iod. ter ways of bridges diculverts have been reased. adside drains also vided abankment height sed along low lying/ential water-logged	IRC:34 Recomme ndations for road constructi on in waterlogg ed area and IRC: 75 and MORT&H guidelines for Design of High Embankm ents	culve nos. culve additi culve Recominor km 29 45.83 47.60 1 no bridge bridge 30.95 Footp drains 41.66 RWH	nstruction of 6 existing bridges at km 25.605, 5.856, km 26.520, km 11, km 47.042 and km	needs.  PT: Stand Design required numbers cross & drains, show culv Hume pil road embankm height, design number bridges.	of Rigg de dow.r.t ar dr	awings	Covery under for consult and local consultations.	costs DPR Itants PPTA	Design Consult		PMC/RP D-PIU-P	

F	Environmer	ntal Remedial Mea		erence laws/		Monito indica	ators	Monit	oring Miti	gation _	Respo	utional nsibility
	sue/Compo			deline	Locations	(Mi Perform Target	nance	Meth		osts	mplementa tion	Supervision /Monitoring
		Project Area and market areas.				with site needs						
2.3 E	Earthqua	<ul> <li>Relevant IS codes shal be adopted in designing the structures to sustain the magnitude of earthquake corresponding to Seismic zone of the project area</li> </ul>	ent of superstruc ture shall be taken as per Clause 222 of IRC:6.		Stretch	MI: Integrity of proposed structures like bridges, culverts and others.  PT: Design conforms BIS and IRC guidelines.	Revie design document and drawing and comparation	n nents ngs arison site tions	F/S consultant, Detailed design cost to be borne by concession aire	Design Consultar t		PPP
2.4 D	Orought (	Ensure water availability for compaction work and consolidation of substructure	2000 Standard	Entire	Stretch	MI: Monitoring GW levels, public consultations with local communities.  PT: Water availability and scarcity in the region and d/s of waterways.		ructur and struct	Covered under F/S consultant cost	Design Consultar t	PMC/Ri	
2.5 Fires		<ul> <li>Measures to avoid accident followed by fuel spills.</li> <li>Removal or maintenance slash or management by controlled burning.</li> <li>Plant fire-resistant species in RoW</li> </ul>	requireme nt		is no forest along sed road.	MI: Monitoring of likely damage to roadside flora and spillage/ fuel accumulation induced accident.			Covered under F/S consultant cost	Design Consultar t	PMC/RI D-PIU-F	

			erence		Monito indica							tutional onsibility
Environmo Issue/Comp			laws/ deline	Locations	(Mi Perforn Target	l)/ nance	Monit Meth		Mitiga Cos		nplementa tion	
3. Loss of Land ar 3.1 Livelihood loss to affected persons	Notified Forest Areas  nd Assets  Road improvemer work to b accommodated within available ROV to the exter possible.  Minimize resettlement impact due to heavil congested built-u section  Social Impact Assessment an Resettlement Plan to be undertaken as per national policy an ADB' guidelines.  Complete a necessary land an property acquisition procedures prior to the commencemer of civil work.  Adhere to the Lan Acquisition	t The Right to Fair Compens ation and Transpare ncy in Land Acquisition, Rehabilitat ion and Resettlem ent Act, 2013 and ADB's involuntar y resettleme nt policy.  Contract Clause for preference to local people during employme nt.	Refer details	SIA/ RAP for more	PT: Zero incidence of forest fires.  MI: Monitoring payment of compensatio n and assistance to DPs as per RP.  PT: Minimal number of complaints/ grievances. No case referred to arbitrator/ court. Payment in compliance of compensati on entitlement matrix of RPs.	Check record design drawin land plant plant person Check status employ t give local people during construin	s; ngs vs lans; ew ed ns of ymen en to	Part adminise resettle costs	and	impleme	nti WD	C/RP PIU-

Environ Issue/Co		Remedial Measu	ıre to l	erence laws/ deline	Locations	Monit indica (M Perfori	ators I)/	Monit Meth	Mitiga Cos		Imple		itional nsibility Supervi /Monito	ision
4.1 Need cutting trees a	Forest L for of a a for a a d for a d	roject Resettlement Plan Income restoration as er RP Preference in Imployment and etty contracts during onstruction to APs Constitute GRC as er RP Incometric Incomet	Forest Conservat ion Act, 1980	Mand planta 225 s	st Diversion = Nil number of affected = 1, 075 Nos.  latory compensatory ation in 1:3 ratio = 3, aplings  all, Contractor shall at least 8, 000 saplings compensatory estation.	MI: Monitoring number and location of geometric adjustments made to avoid forestland and tree cutting, budget amount allocated for compensato ry afforestation and additional plantation.  PT: Avoiding or bare minimum tree felling on Govt. land/ forest/	Revier final design Check budge provise for compete ory affores in Onsite validation of plantatic carried	n. cet dition ensat statio	ation F/S tant ed cost to	RPW Desig coust	gn	PMC/I WD-P	RP	

Environme	ental Remedial Meas		erence laws/			Monito indica	ators	Monito	ina Mitia	ation	F	Institu Respor	itional nsibility
Issue/Compo	onent		deline	Location	<b>S</b>	(Mi Perform Target	nance	Metho			Imple: tic	menta on	Supervision /Monitoring
5. Shifting of Utiliti		1 _	_				1						
5.1 Disruption of utility services to local community	<ul> <li>All telephone and electrical poles/wires and underground cables should be shifted before start of construction</li> <li>Necessary permission and payments should be made to relevant utility service agencies to allow quick shifting and restoration of utility services</li> <li>Local people must be informed through appropriate means about the time of shifting of utility structures and potential disruption of services if any</li> </ul>	requireme	Through	hout the corridor	number computer from peop number timing type notifical time shift of the peop number computer from the peop number time should be people to the people from th	le, per, g and of cations ed to people, taken to utilities  Nos. of blaints ld be  num or. nal time utility	Interact with concerr utility authorit and public	ned F	ncluded Inder RPWD's costs	EPC Contr RPWI y com	D/utilit	AE/PM RPWI PIU-P	D-
E. Construction Sta	age												
1. Preparatory acti	vities												
1.1. Preparatory activities	Submit appointment letter and resume of the EPC Contractor's Environmental Focal Person (EFP) to PMU     EFP will engage PMC Environment Specialist and PMU Safeguard Officer-Environment to a meeting to discuss in detail the EMP, seek	requireme nt	Project Contrac camp		docu EMP consi Meth prope addre all envir	truction od for er essing onment	PMC accomp ment re	olish deport d	Part construction cost for Contractor and PMC Contract	PPP-I	D-	AE/PM RPWI PIU-P	D-

		Reference		Monitori indicato	re		Resno	utional nsibility
Environmental Issue/Component	Remedial Measure	to laws/ guideline	Locations	(MI)/ Performa Target (I	Methods	Mitigation Costs	Implementa tion	Supervision /Monitoring
red coore red coore red coore red coore red red coore red red coore red coor	addlines for abmission in submission in submission in submitted to: i) operation crushers and but not inted to: i) operation crushers and but not inted to: i) operation crushers and hot ix plants, ii) ansport and storage			PT: Compliance of EMP during construction activities.Ap provals, attendance				

Environme Issue/Comp		Remedial Measu	ıre	eferen to law	s/ Locations	indi (	itoring cators MI)/	Monit Meth		ation sts	Implei		
loodo, comp	0110111		"	juluoiii			rmance et (PT)	lilioti		0.0	tic		lonitoring
1.2. Site induction	ex dister locous coover Ari with he hy an coo distinct coordinates of the carries	alth programs on giene, sanitation, d prevention of mmunicable seases will also be cluded in the action an.  FP will submit for proval of PMC-ES e construction mp layout before establishment.  To works will be tiated by the EPC intractor until the e induction training carried out by the	Project requiren nt	ne in Consultation in Consulta	conference/ Meeting Room construction camp of EPC contractor or any other uitable place, adequately ig enough in areal size for bserved required social istancing, where Audiosual facilities for delivering aining programmes, can e installed.	MI: Check Training modules, participants list and number of trainings  PT: Participants adhere the Compliance of EMF during construction activities.	accor ment	mplish report	Part construction cost for Contractor and PMC Contract	RPW PPP-		AE/PMC RPWD- PIU-PPF	

				rence					nitoring dicators				F	Institu Respon		
	Environmen Issue/Compor			aws/ deline	L	ocatio	ons	Perf	(MI)/ ormance get (PT)	Moth		jation ests	Impler	menta	Supe	rvision itoring
1	and layout of workers camp and other	compliance, inspection and audits, and progress tracking and reporting; ii) environmental training and awareness needs shall be determined and documented via a training needs analysis prior to commencement; iii) Health and Safety Awareness Course, which details general environmental awareness and specific performance requirements expected on site; and iv) GRM and v) compliances to implementation of Community Occupational Safety & Health Plan (COSHP) for prevention and control of spread of COVID-19	Project requireme nt. General		contractors	and	sub-	MI: Reviet the design Check compliance	ew Obsegn ns of site lo	ervatio on the ocation	Part construction cost fo Contractor and PMC	RPW PPP-		AE/PN RPWI PIU-P	)-	
	infrastructure facilities	others will be submitted to (Supervision Consultant) and	Condition of the Bid Document					with designments					FIU			

	Environmen		asure to	erence laws/	Locations	Monit indica (M	ators	Monitoring				nstitutiona esponsibili	ty
	Issue/Compor	nent	gui	deline	Locations	Perfori Targe	mance	Methods	Cos	sts '	tion	Supe	ervision nitoring
2.		maintain minimu distance fro following: # 500m from habitation # 500m from wat bodies # 500m from main traff routes • Land agreement will land owner for establishment construction/ labor camps • Submit CTE/ CT from PCB for	ee dd now ee common seer commo			PT: Confirms Camps site not disturbs the nearby habitation and main road traffic. Not to pollute receiving waterbodies.							
	Dust Generation due to construction activities and transport, storage and handling of	submit location ar layout plan fo	or ons for Road and Bridge works	as reconstruct Human commence construct Chodwas	Habitation during cement of ion activities in Benen,	MI: NAAQS Limits, Complaints from locals due to dust.  PT: Compliance	Standa CPCB method Observ ns Public consult n	civil ds cost ratio	works	EPC Contract	ctor F	AE/PMC/ RPWD- PIU-PPP	

Environme	ental Remedial Meas		erence laws/			Monito		Monit	oring	M;4; ~ -	tion	Institu Respon	tional sibility	,
Issue/Comp			deline	Locations		(MI Perform Target	nance	Meth		Mitiga Cos		menta on	Superv /Monite	
construction materials	<ul> <li>Transport, loading and unloading of loose and fine materials through covered vehicles.</li> <li>Paved approach roads.</li> <li>Storage areas to be located downwind of the habitation area.</li> <li>Water spraying on earthworks, unpaved haulage roads and other dust prone areas.</li> <li>Provision of PPEs to workers.</li> </ul>	1974- Sunseque nt Amendme nts and Central Motor and Vehicle Act 1988 General Conditions of Bid Document	Nana Soori Indav	an, Pipar, Uchiya Bara, ın, Maadaliya, Gadh ıya, Borunda, Beetan, ıvar, Satlawas and a City.	s NAAA Numb compl should zero.	er of aints	Revie monito data mainta by contra	oring ained EPC						
2.2 Emission of air pollutants (HC, SO <sub>2</sub> , NOx, CO etc) from vehicles due to traffic congestion and use of equipment and machinery	<ul> <li>Regular         maintenance         of machinery         and equipment.</li> <li>Batching, asphalt         mixing plants and         crushers at         downwind (1km)         direction from the         nearest settlement.</li> <li>Only crushers         licensed by the PCB         shall be used.</li> <li>DG sets with stacks         of adequate height         and use of low         Sulphur diesel as         fuel.</li> <li>LPG should be used         as fuel source in</li> </ul>	The Air (Prevention and Control of Pollution) Act, 1981 and applicable subsequent Amendments.	during activing Bene Bank Uchiy Maad Borur	ners, DG set's ons, Human Habitation g construction ties in Chodwas, n, Buchkallan, aliya, Riyaan, Pipar,	HC, NO <sub>2</sub> ,	liance AAQS. cates ment nery's	Stand CPCE metho Revie monito data mainta by contra	ods w of oring ained EPC	Include civil cost	ed in works	EPC Contr	AE/PM RPWE PIU-P	)-	

Environme Issue/Comp		Remedial Measu	ure to I	rence aws/ leline	Locations	Monito indica (M Perforr Targe	ators I)/ mance	Monit Meth		Mitiga Cos			Institu Respon nenta on	sibilit Supe	
3. Noise and Vibra 3.1 Disturbance to local residents	ins Ar mo Co tra an pla by Ri by Pe ch ve ob Ur Ce an retion  All	enstruction camps stead of wood mbient air quality onitoring. Intractor to prepare affic management and dust suppression an duly approved PD-PIU-PPP-PWD after review TL (AE). Periodic pollution decking of all shicles and otaining of Pollution der Control ertificates (PUCs) and their renewal at quired periods of me.	Legal requireme		ughout project section	MI: day and night Noise	As Noise	per	Include civil	ed in works	EPC Contrac	ctor	AE/PN RPWI		
and sensitive receptors due to excessive noise from construction activities and operation of equipment and machinery	profession of the control of the con	operly maintained. construction equipment and achinery to be fitted th silencers and aintained properly. Is approved quipment shall be sed for construction ctivities. Iming of noisy construction activities shall be done during ght time and	nt Noise Pollution (Regulatio n and Control) Rules, 2000 and amendme nts thereof + Clause No 501.8.6. MORT&H Specificati ons for	sites sensit schoo (LHS) 8.689 (LHS) km 17.15 (LHS) 41.89 (RHS km 55.09	and residential and tive locations as near cls viz; km 8.040 ), km 8.199 (LHS), km 9 (RHS), km 13.550 ), km 13.700 (RHS), 14.201 (RHS), km 20.000 ), km 29.200 (LHS), km 24 (RHS), km 47.399 (RHS), km 50.900 (RHS), 51.800 (RHS), km 66 (LHS), km 62.300 (RHS), km 84.399 (LHS).	levels. Number of complaints from local people  PT: Zero complaints or no repeated complaints by local people. Average day and night time noise	2000	9916 ria for uring sing effects pration ags"	costs				PIU-P	PP	

Environme Issue/Compo		guide	lws/ eline Loca	itions	Monitoring indicators (MI)/ Performance Target (PT)		Mitigati Costs	ion R	Subervision
4 Land and Sail	weekend near schools, Implement noisy operations intermittently to reduce the total noise generated Manage existing traffic to avoid traffic jams and accumulation of noise beyond standards. Restrict construction near residential, built up and forest areas construction to day light hours. Conduct condition surveys of all properties within 25 meters from road edge Vibration monitoring during heavy machinery/ equipment operation Honking restrictions near sensitive areas. PPEs to workers Noise monitoring as per EMoP.	Bridge works DIN 4150 and BS 7385.		ies in within Benen, permi nkaliya, limits a Bara, work Gadh areas Beetan,	ssible for zone Revinoise monidata main by conti	ew of e level toring tained ractor ervatio of tructio			
4.1 Land use Change and Loss of	Non-agricultural areas to be used as		Throughout the section and borrow a	reas pit	Borrow Revi borro			EPC Contractor	AE/PMC/ RPWD- PIU-PPP

Environme	ntal	Remedial Measu		eference to laws/	Locations		Monito indica (M	ators	Monit	oring	Mitiga			Institut Respon	sibility	
Issue/Compo	onent		9	guideline			Perforr Target	nance	Meth	nods	Cos	its	Imple: tic	\n	Super /Monit	
productive / topsoil	ex If lar provential for execution over the solution of the so	getation to protect il erosion.  nd for temporary cilities like nstruction camp, orage areas etc. all be brought back its original land use	IRC Guidelin	nd stora	identified for camp, ge areas etc.	s applic ADB IRC Guide PT: compl or d registe agains contraby owner	oliance with cable and elines. Zero laints isputes ered st actor land	site vi								
4.2 Slope failure and Soil erosion due to Construction activities, earthwork, and cut and fill, stockpiles etc.	en pro Slopro fra pitt ret pla tree Sion gra wir gra pe sp sh the sh	o-turfing of nbankments to otect slopes. ope protection by oviding times, dry stone ching, masonry taining walls, anting of grass and tes. de slopes of all cut of fill areas will be aded and covered th stone pitching, ass and shrub as try design ecifications. Care ould be taken that e slope gradient all not be greater an 2:1.	and 305.2.2 MORT& Specific	projective retain proportion of the project of t	aghout the entire ct road for example sing walls/ toe walls are used for 1.1 km at 3 is sections from km 50 to km 41.050 (RHS), 42.900 to km 43.250 and km 52.710 to km 10 (RHS).  The protection events has proposed with stoneing at various near example approach locations.	of failure erosic issues	on s. o slope es. nal	Revie design docum and obser	n nents site	Includ civil cost	ed in works	EPC	actor	AE/PM RPWD PIU-PI	)_	

		_		Reference			Monito						ı	Institu Respor		
Environme Issue/Comp		Remedial Measu		to laws/ guideline	Locations		(Mi Perform	l)/ nance	Monit Meth	toring nods	Mitiga Cos		Imple: tic	menta	Supe	rvision itoring
4.3 Borrow area management	to general era	e earth stockpiles be provided with ntle slopes to soil osion. on-productive, rren lands, upland	works Guideli IX for erosion IRC Guideli	Soil Borr	ow Area sites	MI: Existe	ence of	Review design		Includ civil	ed in works	EPC Contr	actor	AE/PN RPWI	)-	
	book the person of the state of	rmissions/consent rpths of borrow pits be regulated and les not steeper an 25%. psoil to be ockpiled and otected for use at rehabilitation age. ansportation of rth materials ough covered hicles. llow IRC commended actice for borrow s (IRC 10: 1961)	on bor areas for quarries (Enviro ental protecti Act Rules, 1986; Water Air Act Clause 305.2.2 MORTI Specific ons Road Bridgev ks, Applica ADB IRC Guideli for Bor Areas manage ent	and s nm ion and Act, ) + cati for and wor able and nes row		e unaut d local Poor area mana t prace Numte er accide Comp from people	in ropriat horize ations. borrow gemen tices. estesb of ents. blaints local e. lo case non-liance table and elines.	docum and observ s	site	cost				PIU-P	PP	

Environmen		ure to I	rence aws/	Locations		Monite indica (M	ators	Monit Meth		Mitiga Cos		Imple:	Institu Respon menta	sibility	
Issue/Compor	nent	guic	deline			Perform Targe		wetr	ious	Cos	ะเร	tic	<b>.</b> n	/Moni	
4.4 Quarry Operations	away from habitat areas.  Borrow areas shall be levelled with salvaged material or other filling materials which do not pose contamination of soil. Else, it shall be converted into fish pond.  EPC Contractor to submit copies of STPs/ Land Owners Consent Letters.  Aggregates will be sourced from existing licensed quarries.  Copies of consent/ approval / rehabilitation plan for a new quarry or use of existing source will be submitted to RPWD.  The contractor will develop a Quarry Redevelopment plan, as per the Mining Rules of the state and	Clause No.111.3 MORT&H Specificati ons for Road and Bridge works Guidelines VI for Quarry Areas Managem ent Environm		Quarry if needed and g Quarries	MI: Existe licens quarry from mater be s and Existe a redevent pl PT: licens	y areas which rials to sourced ence of quarry relopm an Quarry se is	Revied design document and observed condition can opening new quarries	nnents, actor nents site vation lianc EC ions se of ng	Include civil cost	ed in works	EPC Contra	actor	AE/PM RPWE PIU-P	MC/	noring
	submit a copy of the approval to EA.  Obtain environmental clearance from SEIAA /DEIAA in case of opening new quarry.	ental Protection Rules			comp	of non- liance consent tions air									

Environme	ntal Remedial Meas		erence laws/			Monite indica	ators	lonit.	oring I	Mitian	tion		utional nsibility
Issue/Compo			deline		Locations	(M Perforr Targe	mance	Meth		Mitigat Cost		nplementa tion	Supervision /Monitoring
4.5 Compaction of soil and impact on quarry haul roads due to movement of vehicles and equipment	Construction vehicles, machinery, and equipment to be stationed in the designated ROW to avoid compaction. Approach roads/haulage roads shall be designed along the barren and hard soil area to reduce the compaction. Transportation of quarry material to the dumping site through heavy vehicles shall be done through existing major roads to the extent possible to restrict wear and tear to the village/minor roads. Land taken for construction camp and other temporary facility shall be restored to its original conditions.	nt	Parkir roads yards	and	eas, Haulage construction	prescribed limit MI: Location of approach and haulage roads Presence of destroyed/c ompacted agricultural land or land which has not been restored to its original condition.  PT: Zero occurrence of demolished/compacted land and undemolishe d land.	Site observa	tion	Included civil w cost	in vorks	EPC	AE/P or RPW PIU-F	/D-
4.6 Contamination of soil due to leakage/ spillage of oil, bituminous and non-bituminous debris	Construction     vehicles and     equipment will be     maintained and     refuelled in such a     fashion that oil/diesel     spillage does not     contaminate the soil.	nt	const dispos 2 Nos propo	ruction ruction sal locat . of Oil ir sed at	station, sites, and camps and cion.  hterceptors are the proposed y-by locations	MI: Quality of soil near storage area Presence of spilled oil or bitumen in project area	Site observa	tion	Included civil cost.	in work	EPC Contract	AE/P or RPW PIU-F	/D-

Epodenom	m4al	Remedial Measu		rence			Monite indica	ators	Man:	oring Mitt	ma4ia			utional nsibility	
Environmer Issue/Compo		Kemediai Measi		aws/ leline	Loc	ations	(M Perforr Targe	mance	Monit Meth		gation osts	Imple		Superv /Monito	
generated from demolition and road construction	<ul> <li>ke</li> <li>dra</li> <li>Ur</li> <li>be</li> <li>an</li> <li>To</li> <li>co</li> <li>lnt</li> <li>pro</li> <li>do</li> <li>are</li> <li>Wa</li> <li>so</li> <li>sh</li> <li>co</li> <li>wa</li> <li>in</li> <li>co</li> <li>of</li> <li>fro</li> <li>Bit</li> <li>will</li> <li>an</li> <li>sit</li> <li>Sta</li> <li>Co</li> </ul>	uelling sites to be pt away from ainage channels. susable debris shall dumped in ditches d low-lying areas.		at km 58.100.	20.450 a	ind km	PT: Soil test conforming to no contaminatio n. No sighting of spilled oil or bitumen in construction site or camp site.								
5.1 Sourcing of water during Construction	• Re	equisite permission all be obtained for	CGWA Guidelines	Througho section	ut the	Project	MI: Approval from	Checki docum tion.		Included i	n EPC	tractor	AE/PI RPWI PIU-P	D-	

	Environment	al Remedial Meas		rence aws/			Monito indica		Mon:	toring Mi	tigation		Institu Respor		у
	Issue/Compon			eline	Locations	•	(M Perforr Targe	nance			tigation Costs		menta on		vision toring
		abstraction of groundwater from Central Groundwater Authority.  Arrangements shall be made by EPC contractor that the water availability and supply to nearby communities remain unaffected.  Water intensive activities not to be undertaken during summer season.  Provision of water harvesting structure to augment recharging of groundwater conditions (aquifers) in the project area.  Permissions from Local Irrigation Department, in case using canal water.  Agreement letters with local level water suppliers.			harvestir at toll plaza	S. au C fre pe w av P ap fre cc au Z fre pe	ompetent uthority omplaints om local eople on ater vailability  T: Valid oproval om ompetent uthority. ero omplaints om local eople.	Talk to people	e						
5.2 wate cons		<ul> <li>Provisions shall be made to connect road side drains with existing nearby natural drains.</li> </ul>	Clause No.1010 EP Act, 1986 MORT&H Specificati ons for Road and	Throug section	the Proje	C dr sy cc si P	I: ondition of rainage vstem in onstruction te. resence bsence of ater	Standa metho Site observand re of docum	ods vation eview	Included civil work co	in EPC ost Cor	C itractor	AE/PM RPW[ PIU-P	)-	

					Referen				toring ators			B#***			Institu Respor	tional sibility
Issue/C	onment Compor		Remedial Meas		to laws		Locations	(N Perfor	II)/ mance et (PT)		toring nods	Mitiga Cos			menta	Supervision /Monitoring
5.3 Alteration surface whydrology	vater	Provision made size ar cross structur areas visioping alignme. Road I raised level will level is HFL. Culverts reconstruct be lean flowsome minor of be divershort provision of the some minor of the days)	to be ned and enhanced. On shall be for adequate not number of drainage res esp. in the where land is towards road ent. evel shall be above HFL wherever road is lesser than so ruction shall done during tow period. In cases, these channels may red for a very period (15-30 and will be back to its	Design require nt, Cla No 501.8.6 MORTA Specific ons Road Bridge	me rivuse ne 27 3. 28 47 for po and 40 kr	ver/ nallah ear wate 7.124, kn 5.605, kn 6.520, kn 7.042, kn onds at so 0.850 to kn m 42.900	inage channels, a crossings etc rways at km a 30.954, km a 25.856, km a 45.831, km a 47.603 and ection from km a 41.050 (RHS), to km 43.250 m 52.710 to km S).	logging in project area.  PT: Existence of proper drainage system. No water logging in project area  MI: Proper flow of water in existing streams and rivers  PT: No complain of water shortage by downstream communities. No record of overtopping/ water logging.	Revie design docur Site obser s	n nents	Include civil cost	led in works	EPC	actor	AE/PM RPWI PIU-P	)-

Environme Issue/Compo	onent	sure to	erence laws/ deline	Locations	Monite indica (M Perforr Targe	ators I)/ mance	nitoring ethods	Mitiga Cos			utional nsibility Supervision /Monitoring
5.4 Siltation in water bodies due to construction activities / earthwork	made at wate bodies.  Silt/sediment shou be collected an stockpiled for possible reuse a surfacing of slope where they have be re-vegetated.  Earthworks an stone work to be prevented from impeding natural flow of rivers, streams an water canals of existing drainage system.  Retaining walls water bodies /pond to avoid siltation near	s Design requireme ent, g Clause No 501.8.6. MORT&H Specifications for Road and Bridgeword ks Worldwide best practices deem word and states	30.95 25.85 45.83 47.60 40.85 52.71	66, km 26.520, km 61, km 47.042, km 63 and ponds at km 60, km 42.900, km	MI: Presence /absence of siltation in rivers, streams, ponds and other water bodies in project area. Turbidity test levels  PT: No records of siltation due to project activities. Surface water quality tests confirm to turbidity and TSS limit	Field observation	Include civil cost	ded in works	EPC	tor RPW PIU-F	'D-
5.5 Deterioration in Surface water quality due to leakage from vehicles and equipment and waste from construction camps.	ponds  No vehicles of equipment should be parked or refuelled near water-bodies, so as to avoic contamination from fuel and lubricants.	d n and o Control of Pollution)	water km 3 25.85 45.83 47.60 section km	31, km 47.042, km	MI: Water quality of ponds, streams, rivers and other water bodies in project. Presence of	Conduction of water quality test as per the monitoring plan  Field observation	er civil ts cost le	led in works	EPC Contrac	AE/P RPW PIU-F	'D-

Empirement	al Domodial Massac		erence			Monito		Manita		Mitiera	4:			itional sibilit	
Environmenta Issue/Compone			laws/ deline	Locations		(Mi Perform Target	nance	Monitor Metho	_	Mitiga Cos		Implen tio	nenta	Supe	
	Oil and grease traps and fuelling platforms to be provided at refuelling locations. All chemicals and oil shall be stored away from water and concreted platform with catchment pit for spills collection. All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up. Readily available, simple to understand and preferably written in the local language emergency response procedure, including reporting, will be provided by the contractors. Construction camp to be sited away from water bodies. Wastes must be collected, stored and taken to approve disposal site only. Water quality shall be monitored.	thereof. / as well as IS-10500:201 2	(RHS const propo locati	am 52.710 to km 52.910 (s), refuelling stations, truction camps, osed Truck-lay-bye ons at km 20.450 and 8.100.	wate in area PT: wate meet fresh quali stand prese	Surface r quality ts water									

Final incompanies	Downsdiel Mossum	Refer			Monito indica		Man:	- = t	NA:4: a.a.	4:			itional sibility	y
Environmental Issue/Compone		e to la guide		Locations	(MI Perforn Target	nance	Monit Meth	nods	Mitiga Cos		Implen tio			vision toring
loss due to site preparation and construction activities	up to toe line considering safety to road users. Roadside trees to be removed with prior approval of competent authority.	1980 + IRC: SP:21 and IRC: SP:66	Estimate tree = 1, Mandato plantatio 225 sapl	Contractor shall least 8, 000 saplings compensatory	MI: ROW width. Number of trees for felling. Compensato ry plantation plan. Number of trees replanted. PT: Compensato ry afforestation done on a 1:3 basis by concessiona ire.	releval docum of cutting permit compe ory planta	nents tree g t, ensat tion and onal tion gy.	y affores cost include projec under Addition compeny affores	ensator station is ed in t costs RPWD. onal ensator station, equired,	Manda Compory planta by Depar t additional planta by Contra	tion forest tmen and onal tion EPC	AE/PM RPWI PIU-P	D-	

Environme	ental Remedial M	-	ference		Monit indica	ators	Monitori	na Mit	gation		Respoi	utional nsibility
Issue/Comp			ideline	Locations	(M Perfori Targe	mance	Method		osts	_	menta on	Supervision /Monitoring
7. Construction Ca 7.1 Impact associated with location	All camps shoul be established w prior permission fre PCB. Camps maintain minimedistance fre following:	Design Requirement to As identified in IEE, a applicable laws, rule and regulation s includin Contract Labour laws a well as EHS		truction camp	MI: Location of campsites and distance from habitation, forest areas, water bodies, through traffic route and construction camps.  PT: Distance of campsite is less than	On observa Interacti with workers	ition civicon ion ocal		in EPC Con	tractor	AE/PI RPWI PIU-F	D-
7.2 Worker's Health in construction camp	wildlife cross areas  • The location, lay, and basic faci provision of earlabour camp will submitted to AE arapproved by PD-P	ng rules.  The ity Building ch and Othe Construct on U- workers (Regulation in Condition in and Condition	r i o off e d d s o	enstruction camps.	500m from listed locations  MI: Camp health records, Compliance to SOPs of COSHP for COVID-19 Protection. Existence of proper first aid kit in camp site. Complaints	contract workers	atio with tor	art of th vil worl ssts		tractor	AE/PI RPWI PIU-F	D-

	Reference		Monitoring indicators			utional nsibility
Environmental Issue/Component Remedial Measu	ure to laws/ guideline	Locations	(MI)/ Performance Target (PT)	Mitigation Costs	Implementa tion	
<ul> <li>Adequate water and sanitary latrines with septic tanks with soak pits shall be provided.</li> <li>Preventive medical facilities in camp</li> <li>Waste disposal facilities such as dust bins must be provided in the camps and regular disposal of waste.</li> <li>The EPC Contractor will take all precautions to protect the workers from insect and pest to reduce the risk to health. This includes the use of insecticides which should comply with local regulations.</li> <li>No liquor or prohibited drugs will be imported to, sell, give and barter to the workers of host community.</li> <li>Awareness raising to immigrant workers/local community on communicable and sexually transmitted diseases.</li> <li>Compliance to SOPs of COSHP for</li> </ul>	and The Water (Preventio n and Control of Pollution) Act, 1974 and amendments thereof		from living near workers.  PT: No record of illness due to unhygienic conditions or vectors.  Zero cases of STD.  Clean and tidy camp site conditions.  Compliance to SOPs of COSHP for COVID-19  Protection.			

Environm Issue/Com	ponent	Remedial Measu	ıre to	erence laws/ deline	Loc	cations	Monite indica (M Perforr Targe	ators I)/ mance		oring nods	Mitiga Cos			utional nsibility Supervisior /Monitoring
	l l	OVID-19 otection.												
8 Management o		ruction Waste/Debri	<u> </u>											
8.1 Selection of Dumping Sites	f • Coa a dis it and RF e Cr du no ind de lea int ma gre e sit res wa e Du be ca que e Pu co vill ha be loc	ontractor to submit waste/spoil sposal plan and get approved by AE and PD-PIU-PPP-PWD. The eate controlled amping sites with a sub-permeable lining corporated in the pit esign to avoid achate seepage to the soil, which any later affect ound water quality approductive/wastel and shall be lected for dumping es away from sidential areas and ater bodies amping sites must be having adequate pacity equal to the lantity of debrishment from the lage Panchayats as to be obtained affore finalizing the cation.	Design Requirem ent, MORT&H guidelines and General Conditions of Contract Document , Constructi on and Demolition Waste Managem ent Rules- 2016 and subseque nt Amendme nts.	Sites	Dumping/		MI: Location of dumping sites Number of public complaints.  PT: No public complaints.  Consent letters for all dumping sites available with contractor.	people Review conse letter	etion local e. w of nt	cost.	works	EPC Contractor	PIU-F	D- PPP
8.2 Reuse and disposal or construction and dismantled waste	f su	ne existing bitumen rface shall be lized for paving of	Design Requirem ent, MORT&H	Through corridor	out the	project	MI: Percentage of reuse of existing	Contra record		Included civil cost.	d in works	EPC Contractor	AE/P RPW PIU-F	D-

	_		eference			toring				utional nsibility
Environmenta Issue/Compone			o laws/ uideline	Locations	(N Perfor	MI)/ mance et (PT)	Monitoring Methods	Mitigation Costs	Implementa tion	
•	cross roads, access roads, and paving works in construction sites and camps, temporary traffic diversions, and haulage routes.  All excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping.  Unusable and non-bituminous debris materials should be suitably disposed of at pre-designated disposal locations, with approval of the concerned authority. The bituminous wastes shall be disposed in secure landfill sites only in environmentally accepted manner. For removal of debris, wastes and its disposal, MORTH guidelines should be followed.  Unusable and surplus materials, as determined by the Project Engineer, will	guideline and General Condition of Contract Documen Construct on ar Demolitic Waste Manager ent Rule 2016 ar subsequent Amendments.	nt ti nd on n es nd		surface material  Method and location of disposal site of construction debris  PT: No public complaint and consent letters for all dumping sites available with contractor or AE.	with people				

Environmo	ntal	Remedial Measu		rence aws/		Monite indica		Mon:	oring	Mities	tion			itional nsibility	
Issue/Comp				aws/ leline	Locations	(M Perforr Targe	nance	Monit Meth		Mitiga Cos			menta on	Superv /Monito	ision oring
		sposed off-site.													
9. Traffic Manager			Danima	There	aland the makest	N41. T46:-	Davis		la alval		LEDO		_ ^ _ /DI	40/	
9.1 Management of existing traffic and safety	Plisus co approximate training properties of the contract of t	ans shall contain tails of diversions; affic safety rangements during teasures for night ne traffic and tecautions for ansportation of hazardous aterials. Timing and theduling to be one so that ansportation of angerous goods is one during least amber of people and other vehicles on the road. The Contractor will assure that the version/detour is ways maintained in anning condition, articularly during the consoon to avoid sruption to traffic tow.	Design requireme nt and IRC: SP: 27 -1984, Report Containin g Recomme ndation of IRC Regional Workshop s on Highway Safety IRC: SP: 32 -1988 Road Safety for Children (5-12 Years Old) in Constructi on Zones IRC: SP:55-2014  The Building and other Constructi on	up a inters prone and school	ighout the project or especially at built- areas, major/ minor ections and accident- areas at sharp curves sensitive areas like ol, hospitals and ous places.	MI: Traffic managemen t plan. Presence/ absence of safety signs, traffic demarcation s, flag men etc. on site. Complaints from road users. No of accidents.  PT: No complaints. No accidents due to poor traffic managemen t. Traffic signs, demarcation lines etc. present in appropriate locations on site.	of manage nt safety syster Check based monitor	geme n vation traffic geme and m klists l oring	Includ civil cost.	ed in works	EPC	actor	AE/PN RPWI PIU-P	D-	
	• Or	n stretches where it not possible to													

Environme	ental Remedial M	logeuro		rence aws/		Monit indica		Mon:	oring	Mitiga	tion		Institu Respor		
Issue/Comp		ieasure		aws/ leline	Locations	(M Perfori Targe	mance		toring nods	Cos		Imple: tic	menta on	Super /Mon	rvision itoring
	diversions will constructed.  Restriction construction act to only one side of existing road  The contractor sinform I community changes to tractor routes, pedestrian accommunicy	ting and Act ved 1996 be Fact Act of Sect vity of Emp s Request of Doct affic and ess with AE". Juste sure hent duct udit es.	ories 1948 + ion 6 loyer' uirem of Bid ument												
9.2 Pedestrians, animal movement	<ul> <li>Temporary according and diversion, proper drain facilities.</li> <li>Access to schools, temples other public playmust be maintal when construct takes place in them.</li> <li>Fencing where animal movement expected.</li> </ul>	the and ces ned tion lear		sides constr	habitation on both of schools, temples, ruction sites, haulage, diversion sites.	MI: Presence/ absence of access routes for pedestrians. Road signage Number of complaints from local people PT: Easy access to	Field observ Interact with people	ction local	Include civil cost.	ed in works	EPC Contr	actor	AE/PI RPWI PIU-P	<b>)</b> -	

Environment	ital Remedial Meas		erence laws/			Monito		Monit	oring	Mitiga	tion	F	Institu Respon		
Issue/Compon			deline	Locations		(MI Perforn Target	nance	Meth		Cos		Imple: tic		Super /Moni	
9.3 Safety of Workers and accident risk from construction activities	<ul> <li>Large number of box culverts has been proposed. All structures having vertical clearance above 2m and not catering to perennial flow of water may serve as underpass for animals.</li> <li>Contractors to adopt and maintain safe working practices.</li> <li>Usage of fluorescent and retro refectory signage, in local language at the construction sites</li> <li>Training to workers</li> </ul>	Same as above	Cons	truction sites	school temple public places compla	Target s, es and . Zero eints  collity Safety to es. e		w ds on g and	Includ civil cost	ed in works	Obliga of Contr	ation EPC	AE/PN RPWI PIU-P	MC/ )-	toring
	on safety procedures and precautions.  Mandatory appointment of safety officer.  All regulations regarding safe scaffolding, ladders, working platforms, gangway, stair wells, excavations, trenches and safe means of entry and egress shall be complied with.  Provision of PPEs to workers.  Provision of a readily available first aid unit				safety. Number safety related accide PT: fatal accide Zero minor fatal accide	er of I nts Zero nts. or non-	Interactivity with construction of the constru	uctio							

Environme Issue/Comp		lial Measure	e to la	rence aws/ eline	Locations	Monit indic (M	ators	Monito Meth		Mitiga Cos	te Impi	Respoi ementa	itional nsibility Supervision
Issue/Comp	including adequate su dressing mate The contract not employ person below of 18 years Use of ha material sho minimized restricted.	erials. etor will y any the age azardous ould be and/or	guid	eline		Perfor	,	Meth	ods	Cos		tion	/Monitoring
	contractor.	hall be respond dents or evention ast be by the											
9.4 Accident risk to local community	<ul> <li>Restrict acconstruction only to aupersonnel.</li> <li>Physical semust be proving movement vehicular and traffic.</li> <li>Adequatemust be provision temporary diand awaren locals before</li> </ul>	sites atthorized paration vided for of d human signage vided for oversions ness to	Same as above	Sidew zones marke urban haulag	et areas and semi areas, habitations, ge roads, diversion sensitive receptors schools, hospitals,	MI: Safety signs and their location. Incidents of accidents. Complaints from local people.  PT: Zero incident of accidents. Zero complaints.	Site inspect Consul n with people	tatio local	Include civil cost	d in works	EPC Contractor	AE/PI RPWI PIU-F	D-

Environmental	Remedial Measu		rence aws/		Monite indica		Mar:	o ring	Mision	ıtion.		Institu Respor	tional sibility
Environmental Issue/Component			aws/ leline	Locations	(M Perforr Targe	nance	Meth	oring nods	Mitiga Cos		_	menta on	Supervision /Monitoring
	ew construction	<u>'</u>											
	ont												
10.1 Clean-up Operations, Restoration and Rehabilitation  • Continue of the co	ones including river- leds, culverts, road- ide areas, camps, ot mix plant sites, rushers, batching lant sites and any other area led affected by the roject will be left lean and tidy, to the atisfaction of the environmental epecialist (PMC), environmental epecialist (AE) and environmental epecialist (AE) and environmental epecialist (AE) and environmental ereson (EPC contractor). If the opened forrow areas will be ephabilitated and 'AE' vill certify to atisfaction.	Project requireme nt	corrid	ighout the project or, construction camp and borrow areas	MI: Condition of camp, borrow areas and construction sites, Presence/ absence of construction material/deb ris after completion of construction works on site.  PT: Clean and tidy sites. No trash or debris left on site. Site restored and levelled.	Site observation of all is satisfat	ction ocals letion cate ation sites found	Include civil cost.	ed in works	EPC	actor	AE/PN RPWI PIU-P	)-
F. Operation and Mair	ntenance stage												

Environme			aws/	Locations	Monit indica (M	ators	Monit		Mitiga			itutional onsibility
Issue/Compo	onent	guide	eline	Locations	Perforr Targe	mance	Meth	nods	Cos	ts '	tion	Supervision /Monitoring
1.1 Air pollution due to due to vehicular movement		ental Protection Act, 1986; The Air (Preventio n and Control of Pollution) Act, 1981, Motor Vehicles Act 1948 and subseque nt Amendme nts .	Huma comm Chody Buchk Riyaa Nanar Sooriy Indaw Merta Sensit the al viz; k 8.199 (RHS) km 14.20 (RHS) km 50.90 (RHS) km 6	callan, Bankaliya, n, Pipar, Uchiya Bara, n, Maadaliya, Gadh ya, Borunda, Beetan, rar, Satlawas and City.  tive Receptors along ignment near schools rm 8.040 (LHS), km (LHS), km 8.689 (LHS), km 13.550 (LHS), 13.700 (RHS), km 1 (RHS), km 17.152	MI: Ambient air quality (PM <sub>10</sub> , CO, SO <sub>2</sub> , NO <sub>2</sub> )  PT: Levels are equal to or below baseline levels given in the IEE report.	As CPCB require ts Site inspec	emen	Includ Opera Mainte cost		Implem ation EPC Contract and Supervin monitor by AE/PMCPPPP	by RP PIL stor & ing C/R	PMC/ WD- I-PPP

Facilities		Domo dial Marco		eference		Monite indica	_	Mani		NA:4:	4:	F	Institu Respor	itional sibility	1
Environme Issue/Compo		Remedial Measu		to laws/ uideline	Locations	(M) Perforn Target	I)/ mance	Monit Meth		Mitiga Cos		Impler tio	nenta	Super	vision toring
2.1 Noise due to movement of traffic  3. Land and Soil	mago coo mago coo mago see Mc coo Coo fur bago see with coo coo difference to coo coo difference who coo coo coo coo coo coo coo coo coo c	nditions shall be aintained beed limitation to 20 n/hour and honking strictions near nsitive receptors onitoring of erformance of bise Barriers nstructed and New onstruction of any other required noise rriers near nsitive receptors the consent of local mmunity eate awareness nongst the sidents about likely ise levels from ad operation at ferent distances,	Noise Pollution (Regulati n ar Control) Rules, 2000 ar amendm nts thereof	location km 8 (LHS) 13.55 (RHS) km 20.00 (LHS) km 50.90 (RHS) km 6 84.39 Human commonst Chod Buchl Riyaan Nana	kallan, Bankaliya, ın, Pipar, Uchiya Bara, n, Maadaliya, Gadh ya, Borunda, Beetan, yar, Satlawas and	MI: Noise levels  PT: Levels are equal to or below baseline levels given in the IEE report.	Noise monito as noise 2000  Discus with pat ser recept sites	per rules, ssion people nsitive	Included Operation Mainten- cost	on /	Imple ation EPC Contra and Super n monito by AE/PI PPP	by actor visio & oring MC/R	AE/PM RPWI PIU-P	<b>)</b> -	
3.1 Soil erosion at embankment during heavy rainfall.	be the the me	eriodic checking to carried to assess e effectiveness of e stabilization easures viz. turfing, one pitching, river	Project requirem nt	e emba	ridge locations and nkment slopes and probable soil erosion .	MI: Existence of soil erosion sites Number of soil erosion sites	On obser	site vation	Included Operation Mainten- cost	on /	Imple ation EPC Contra and Super n	by actor	AE/PN RPWI PIU-P	D-	

Environme Issue/Compo		Remedial Meası	ure to	ierence laws/ ideline	Locations	Monit indica (M Perfori Targe	ators I)/ mance	onitoring Methods	Mitiga Cos	ts Imple		utional nsibility Supervision /Monitoring
	etc Neeto to whe	cessary measures be followed erever there are ures				PT: Zero or minimal occurrences of soil erosion.				monitoring by AE/PMC/R PWD-PIU- PPP		
4.1 Siltation	• Reberoor	gular checks shall made for soil sion conditions for effective intenance.	Project requireme nt	like ri 27.12 25.60 26.52 47.04 ponds 40.85 km 2 (B/S)	surface water bodies iver, waterways at km 24, km 30.954, km 25.856, km 26, km 45.831, km 26, km 47.603 and s at section from km 30 to km 41.050 (RHS), 12.900 to km 43.250 and km 52.710 to km 0 (RHS).	MI: Water quality.  PT: No turbidity of surface water bodies due to the road.	Site observat s	on Ope	uded in ration / ntenance	Implement ation by EPC Contractor and Supervisio n & monitoring by AE/PMC/R PWD-PIU-PPP	PIU-P	D-
4.2 Water logging due to blockage of drains, culverts or streams	(at mo ens wat through the character of the character)	cks and cleaning least once before nsoon) of drains to sure that flow of ter is maintained bugh cross drains	Project requireme nt		surface water bodies/ drains/ side drains ons.	MI: Presence/ absence of water logging along the road  PT: No record of overtopping/ Water logging.	Site observat s		ration / ntenance	Implement ation by EPC Contractor and Supervision & monitoring by AE/PMC/R PWD-PIU-PPP	AE/PI RPWI PIU-P	D-
5. Flora	I		<u>l</u>			I	<u> </u>	I		<u>l</u>	1	
5.1 Vegetation	• Pla shr	nted trees, ubs, and grasses	Forest Conservat	, ,	ct tree plantation sites	MI: Tree/plants survival rate	Records and fi observat		ided in ration /	Implement ation by EPC	AE/PI RPWI PIU-P	D-

Environm Issue/Comp	onent		ure	Reference to la guide	ws/	Locations	(M Perfor	ators		toring nods	Mitiga Cos	ts		utional nsibility Supervision /Monitoring
	Tl     at     at     to     et	he tree survivaludit to be conducted tleast once in a year assess the ffectiveness	ion 1980	Act			PT: Minimum rate of 70% tree survival.	s. Inform from Forest Depar t	try	Mainte cost	enance	Contractor and Supervision & Supervision & Supervision   monitoring by AE/PMC/R PWD-PIU-PPP	k .	
6.1 Accident Risk due to uncontrolled growth of vegetation	M CC VE     M pi     S m     R m     tri     al     N pl	laintain shoulder ompletely clear of egetation.  linimum offset as rescribed in IRC: P:21-2009 to be eaintained egular eaintenance/imming of plantation long the road side o invasive lantation near the bad sides	Project required nt IRC: SP:21- 2009	eme	Throughou route.	t the Project	MI: Presence and extent of vegetation growth on either side of road. Number of accidents.  PT: No accidents due to vegetation growth.	Visual inspec Check accide record	etion E ent	Include Operat Mainte cost	tion /	Implement ation by EPC Contractor and Supervision & monitoring by AE/PMC/R PWD-PIU-PPP	PIU-	'D-
6.2 Accident risks associated with traffic movement.	m sp en	raffic control leasures, including beed limits, will be inforced strictly. Surther incroachment of squatters within the ROW will be prevented. It is a fety provisions accluded in design and construction	IRC: SP:55- 2014 IRC: SP:88- 2010	and	prone area junctions' I 9.340, kn 17.100, kr school), k	t the Project cially at accident s at major 4-arm ocations viz; km n 13.525, km n 26.030 (Near m 62.160, km n 78.140 and km	MI: Number	Review accided record Site observings	ent Is	Include Operat Mainte cost	tion /	Implement ation by EPC Contractor and Supervision & monitoring by AE/PMC/R PWD-PIU-PPP	PIU-	'D-

Environme	ntal	emedial Meas		rence aws/			Monite indica	ators Mo	nitoring	Mitiga	ution		ıtional nsibility	
Issue/Compo		emediai weas		leline	Loc	ations	(M Perforr Targe	mance M	ethods	Cos		Implem tio	Supervis /Monitor	
	clock Phone accident and services minimul time for accident possible Tow-wathe vehicles Road should	patrol patrol for round the patrolling. booth for tal reporting ambulance with m response rescue of any t victims, if					inside the stipulated planning line as per relevant local law  PT: Fatal and nonfatal accident rate is reduced after improvemen t.							
6.3. Transport of Dangerous Goods	Emerge vehicles	ion and and ncy sive system ncy plan for	OHS Standards / Material Safety Data Sheet (MSDS)	Througho stretch	out the	project	MI: Status of emergency system — whether operational or not  PT: Fully functional emergency system	Review of spill prevention and emergency response plan Spill accident records	Opera Maint cost		Imple ation EPC Contra and Super n monito by AE/PI PWD-PP	by actor rvisio & oring MC/R		

EFP: Environmental Focal Person, RPWD: Rajasthan State Public Works Department, NPK: Nitrogen, Phosphorous and Potassium, PMC: Project Management Consultant, AE: Authority Engineer, IEE: Initial Environmental Examination, IRC: Indian Road Congress, DEIAA: District Environmental Impact Assessment Authority, SEIAA: State Environmental Impact Assessment Authority, CPCB: Central Pollution Control Board, IS: Indian Standard

## **Environmental Monitoring Plan for Dantiwara-Merta City Road**

Env. Indicators	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervisi on/Monito ring
Air Quality	Constructio	PM <sub>10</sub> PM <sub>2.5</sub>	High volume	Human Habitation	During Active	Air quality	70x	EPC	AE/PMC/R
	n stage	SO <sub>2</sub> , NO <sub>X</sub> , CO	sampler to be	during	Construction	standard by	9000=Rs.63	Contractor	PWD-PIU-
			located 50 m	commencement of	Phase	СРСВ	00000.00	through	PPP
			from the	construction				approved	
			selected	activities in				monitoring	
			locations in the downwind	Chodwas, Benen, Buchkallan,				agency	
			direction. Use	*					
			method	Pipar, Uchiya Bara,					
			specified by	Nanan, Maadaliya,					
			CPCB	Gadh Sooriya,					
			0.05	Borunda, Beetan,					
				Indawar, Satlawas					
				and Merta City.					
				Batching and hot					
				mix plants					
				sampling part of					
				SPCB annual					
				renewal of permits					
				Total No of					
				Samples 2 times in					
				each human					
				habitations during					
				construction period					
				-52 samples					
				One sample for					
				HMP, one sample for Batching/ RMC					
				Concreate Mix Plan					
			and one sample for						
				WMM Plant in each					
			quarter during						
				construction					
				period. Total No of					
				sample-18					
				samples.					

Env. Indicators	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervisi on/Monito ring
	Operation stage			Total numbers of samples 70 during entire scheduled construction period. No of samples may increase for EOT period.  Toll Plaza-one same each quarter. Total 3 samples in a year.	24 hr continuous, 3/year for 1 year of operation	Air quality standard by CPCB	12X9000 =Rs 108000.00	EPC Contractor through approved	AE/PMC/R PWD-PIU- PPP
Water	Constructio	Ground water:	Grab sample	Human habitations, especially sensitive receptors. 3 samples in each quarter. Total no of 9 samples.  Groundwater at	period (Total 3 times in a year Except Monsoon Season)	Water	18x 5000	monitoring agency	AE/PMC/R
Quality	n stage	(IS: 10500:2012) and Surface water criteria for freshwater classification	Grab sample collected from source and analyse as per Standard Methods for Examination of Water and Wastewater	Construction Camps	end of construction activities (Total 3 times in a year baring monsoon), 1 bore well, 1 surface water sample in each quarter. Minimum 3 samples in each quarter. Total no 18 samples during entire scheduled construction period. No of samples may increase for EOT period.	quality standard by CPCB	= Rs 90000.00	Contractor through approved monitoring agency	PWD-PIU- PPP

Env. Indicators	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervisi on/Monito ring
	Operation stage			Groundwater at 2 locations and surface water at 2 locations	3/year for 1 year	Water quality standard by CPCB	12x5000=Rs. 60000.00	EPC Contractor through approved monitoring agency	AE/PMC/R PWD-PIU- PPP
Noise levels	Constructio n stage	Equivalent Noise levels on dB (A) scale for day and night	IS:4954-1968 as adopted by CPCB for Identified Study Area CPCB/IS:4954- 1968Using Noise level	Same as air quality Total numbers of samples 70 during entire scheduled construction period. No of samples may increase for EOT period.	During Active Construction Phase	National Ambient Noise Standard specified in Environmen t Protection Act, 1986	70x1500=Rs. 105000.00	EPC Contractor through approved monitoring agency	AE/PMC/R PWD-PIU- PPP
	Operation stage		meter	Same as air quality	3/year for 1 year		12x1500=Rs. 18000.00	EPC Contractor through approved monitoring agency	AE/PMC/R PWD-PIU- PPP
Soil Quality	Constructio n Stage	NPK (ICAR standard) and heavy metals	As specified by the site engineer RPWD / supervision consultant	Camp, Dumping/storage areas and HMP sites (Total 4 sample locations)	Once during entire construction stage	ICAR standards	4x3000=Rs.1 2000.00	EPC Contractor through approved monitoring agency	AE/PMC/R PWD-PIU- PPP
	Operation stage	Oil and grease		At oil spillage locations and other probable soil contamination locations (Total 3 samples)	Once for the first year of operation	ICAR Standards	3x3000=Rs.9 000.00	EPC Contractor through approved monitoring agency	AE/PMC/R PWD-PIU- PPP
Soil Erosion	Constructio n Stage	Visual check for Soil erosion and		Throughout the Project Corridor especially at River	After first rain	Visual Checks	Included in Engineering Cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP
	Operation Stage	siltation		banks, bridge locations and river training structures	Once during operation of 1st year	Visual Checks	Routine Engineering Work	AE/PMC/RPWD	Team of -PIU-PPP
Drainage Congestion	Constructio n stage	Visual Checks		Throughout the Project Corridor especially Probable	Once in a year before rainy season	None Specific	Included in Engineering Cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

Env. Indicators	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervisi on/Monito ring
	Operation Stage			drainage congestion areas	Once in a year before rainy season	None Specific	Routine Engineering Work	Engineering Tea AE/PMC/RPWD	-PPP
Borrow Areas- Prior obtaining of ECs for borrow	Constructio n Stage	Visual Checks	IRC guidelines	Borrow areas to be operated	Once in a month	ADB and IRC guidelines	EPC Contractor	EPC Contractor with approval from AE/PIU-RPWD-PPP	AE/PMC/R PWD-PIU- PPP
areas is exempted by MoEFCC	Operation Stage	Visual Checks	Rehabilitation asper IRC guidelines	Closed Borrow Areas	Quarterly for 1 year			EPC Contract approval from RPWD-PPP	AE/PIU-
Constructio n Sites and Labour Camp	Constructio n stage	Hygiene, drainage Medical Facilities Etc.	Rapid audit as per reporting format	Construction Sites and Camp	Quarterly during construction period	IRC guidelines	Part of the regular monitoring	EPC Contractor with approval from AE/RPWD-PIU-PPP	AE/PMC/R PWD-PIU- PPP
Tree Plantation	Constructio n Stage	Surveillance me felling	onitoring of trees	Throughout the Project Section	During site clearance in construction phase	As suggested by Forest Dept.	Compensato ry: RPWD Additional Plantation: Provisional sum under Civil Cost	Compensatory: RPWD/Local Departments Additional Implementation Contractor. Supmonitoring AE/PMC/RPWD	ervision and by
	Operation stage	Audit for survi	val rate of trees	Throughout the Project Section	Quarterly during Defect Liability Period			through Contractor responsible for n	up to the Period in any n. After this VD-PIU-PPP PMC/EPC will be
Record of Accident	Constructio n Stage	suggested	and cause of lethodology as by IE/Safety d approved by	crusher, diversions, HMP, earthwork, demolition site etc.	occurrence of accidents	As suggested by PMC/IE/RP WD-PIU- PPP	Part of the regular monitoring	EPC Contractor	AE/PMC/R PWD-PIU- PPP
	Operation stage			Throughout the stretch	occurrence of accidents	Same as above	Same as above	Road Safety uni PIU-PPP, with s local police, AE	support from

Env. Indicators	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervisi on/Monito ring		
Monitoring Costs: INR 1041000 00 excluding other applicable charges including GST to be mentioned in Terms and Conditions of Contract Agreement											

Monitoring Costs: INR 1041000.00 excluding other applicable charges including GST to be mentioned in Terms and Conditions of Contract Agreement signed between EPC Contractor and Outsourced Monitoring Laboratory.

## **ENVIRONMENT MANAGEMENT PLAN FOR CHURU-TARANAGAR-NOHAR ROAD**

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	e-construction Stage							
1. Alignment/Pave			1		1		T.	
1.1. Pavement damage and inadequate drainage provisions	<ul> <li>Proposed design adopted in accordance with the provisions of the following IRC and BIS Codes/ MoRTH guidelines/ AASHTO specifications.</li> <li>Geometrical design standards will mostly follow:</li> <li>2-Lane Plus Carriageway:</li> <li>Carriageway Width = 7.0m,</li> <li>Paved Shoulder Width = 2 x 1.5m,</li> <li>Earthen/ Granular/ Paver block Shoulder Width= 2 x 2.0m or varying width shoulder.</li> <li>Side Drain = 2 x 1.5m footpath drain</li> <li>Roadway Width = 14.0m (Minimum)</li> <li>Roadway Length = 68.130 km</li> <li>4-Lane Divided Carriageway:</li> <li>Carriageway Width = 7.5m each with 1.5m Median.</li> </ul>	Section 2 of the Manual of Specifications and Standards for Two Lanning of Highways with Paved Shoulder (IRC: SP:73-2018)	10 pipe culverts are proposed to prevent water logging and flooding in Churu-Tara Nagar Section which is passed by no river or water body crossed by the project road. However, there are few minor dry natural streams crossed by the project road. 4 slab culverts and 8 pipe culverts are proposed in Taranagar-Nohar Section of the road. The Contractor shall prepare drainage plan for complete highway and provide Minimum 20 additional new	and number of cross and side drains, slab/box culverts, and Hume pipes  PT: Design and numbers are in accordance with site needs  Checklists	documents & drawings and comparison	Covered under preliminary design preparation by F/S consultant  Detailed design cost to be borne by EPC Contractor	Design Consultant	PMC/RPW D-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	<ul> <li>Paved Shoulder Width = 2 x 1.5m,</li> <li>Paver Block Shoulder Width = 2 x 2.0m or varying width shoulder.</li> </ul>		culverts as per drainage design requirements at locations finalized in consultation with Authority Engineer (AE) and shall not be considered as Change of Scope.  Toll Plaza = 3 1st Toll Plaza from CH-19+250 2nd Toll Plaza from CH-19+250 3rd Toll Plaza from CH-53+950 to 54+250 3rd Toll Plaza from CH-53+910 to 98+010					
1.2. Pavement Design	<ul> <li>Vertical and horizontal geometrics in consistent to IRC/MORTH guidelines</li> <li>Provision of crash barriers at high embankments.</li> <li>Speed breakers in habitat areas, schools, junction</li> </ul>	Design requirement IRC:SP:73- 2007 IRC:SP:84- 2014 IRC:8, IRC:25, IRC:26, IRC:35,	Curve locations  List of Major and Minor Junctions requiring improvements is given in Section-3 of Schedule-B. All	MI: number and location of crash barriers, speed breakers, warning sign boards, road studs, object markers etc	Review of design documents and drawings and comparison with site conditions	Covered under preliminary design preparation by F/S consultant  Detailed design cost	Design Consultant	PMC/RPW D -PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	and curves to regulate speed.  Provision of retroreflective warning signboards near school, hospital, religious places and forests  Safety kerb at all bridges Informatory signage on approach to built-up section  Ambulance and medical aid posts  Checking for overloading at toll plazas  Speed restrictions in built up sections curve locations etc	IRC:67, IRC:103 and Section 800 of MoRTH Specifications  Horizontal geometry will be based on IRC: 38-1988 and vertical geometry will be based on IRC: SP 23- 1993 ". IRC: SP: 67- 2012	the existing junctions to be improved to the corresponding Design Vehicle and all minor junctions to be improved to 60m on side roads.  Speed Breakers and signages near built-up areas and toll plazas  3 Toll Plazas: 1st Toll Plaza from CH-19+250 2nd Toll Plaza from CH-19+250 3rd Toll Plaza from CH-53+950 to 54+250 3rd Toll Plaza from CH-97+110 to 98+010.	PT: numbers and location are in accordance with site needs.  Checklists based monitoring		to be borne by EPC Contractor		
1.3. Drainage provisions	Raised embankment and provision of roadside drainage to prevent damage to pavement due to water logging on the road and also	Provision of lined drain as per IRC: SP:42-2014 & IRC: SP:50-2013.	Cross- Drainages Culverts Reconstruction 4 nos. slab culverts to Box	MI: Monitoring of the function of cross drainage, longitudinal	Review of detail design documents & drawings and comparison	Covered under preliminary design preparation	Design Consultant	PMC/RPW D-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	<ul> <li>inconvenience caused to nearby community.</li> <li>Provision of adequate nos. of cross drainage structures.</li> <li>Increased (vent and height) in waterway of existing structures.</li> <li>Roadside drains have been proposed with suitable outfalls.</li> <li>Additional culverts and bridges</li> <li>Causeway and submerged bridges to be replaced with high level bridges</li> <li>Roadside longitudinal drains to avoid water logging in built-upsections and rural sections proposed with suitable outfalls.</li> <li>Prevention of waterlogging and overtopping due to intensive rainfall.</li> </ul>	IRC SP: 42-2014 and IRC SP: 50-2013.  MORTH Specifications for Road and Bridge Works 5th Revision 2013	culverts, 18 nos. HPC to HPC/Box culverts) and 20 nos. of additional new HPC/ Box culverts.  Longitudinal drains (B/S together) Footpath cum covered drains in built-up sections.  RWH at every 2km in a staggered manner on LHS and EHS in the entire project length.	Design and required numbers of cross and side drains, slab/ box culverts, and Hume pipes	with site conditions	by F/S consultant  Detailed design cost to be borne by EPC Contractor		
1.4. Safety along the proposed alignment	<ul> <li>Vertical and horizontal geometrics in consistent to adequate numbers of road signs and pavement markings IRC/MORTH guidelines.</li> <li>Provision of crash barriers at high embankments.</li> </ul>	Design requirement IRC:8, IRC:25, IRC:26, IRC:35, IRC:67, IRC: 79, IRC: 99 IRC 119,	Speed Breakers and signages, LED traffic beacons, Pedestrian facilities near built-up areas and toll plaza	MI: Monitoring of the functioning/ performance of proposed safety measures, w.r.t proposed	Review of design documents and drawings and comparison with site conditions	Covered under preliminary design preparation by F/S consultant  Detailed design cost	Design Consultant	PMC/RPW D-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	<ul> <li>Speed breakers in habitat areas, schools, junction and curves to regulate speed.</li> <li>Provision retroreflective warning signboards, LED traffic beacons near school, hospital, religious places and forests</li> <li>Safety kerb at all bridges</li> <li>Informatory traffic signage/ Road markings on approach to built-up sections on Ambulance and medical aid posts</li> <li>Checking for overloading at toll plazas.</li> <li>Speed restrictions in built up sections curve locations etc.</li> <li>Roadside Safety Barriers near culverts, bridges.</li> <li>Pedestrian Guard Rails / Footpath Facilities at Schools.</li> <li>Other road safety furniture comprising road signs, road markings, object markers, hazard marker, studs, delineators, attenuators, safety barriers, pedestrian guard rails, boundary stones, kilometre stone etc.</li> </ul>	and Section 800 of MoRTH Specifications	and near school, hospitals and other sensitive areas. Road Studs, Road signs, markings, object Markers etc shall be finalized in consultation with Authority's Engineer Metal beam crash barriers provided at embankment above 3m, at sharp curve and along retaining wall locations and on approaches to structures, bridges, and culverts in consultation with Authority Engineer.  Roadside & Median Safety barriers shall be provided finalized in consultation	needs and maintenance.  PT: Required numbers and location of crash barriers, speed breakers, warning sign boards, road studs, object		to be borne by EPC Contractor		

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
			with Authority's Engineer.					
2. Natural Disaste	r and Climate Change Risks		Toll Plazas=3					
2.1. Damage to pavement integrity like Rutting, embrittlement, softening and migration of liquid asphalt and paved surfaces	<ul> <li>Flexible Pavement Thickness is proposed for almost entire length with minimum design period of 20 years.</li> <li>CBR value of sub grade as per IRC guidelines.</li> <li>40mm BC with PMB-70 has been considered as surface course and 60mm DBM with VG-30 has been considered for Base/ binder course.</li> </ul>	IRC:37 & IRC:58 for flexible pavement design.	Entire stretch	MI: Monitoring pavement surface quality interms of roughness, cracking, rutting, softening etc.  PI:No softening, rutting, asphalt migration/ thermal expansion of joint	Review of design documents and drawings and comparison with site conditions	Covered under preliminary design cost of F/S consultant  Detailed design cost to be borne by EPC Contractor	Design Consultant	PMC/RPW D-PIU- PPP
2.2. Flooding/ Water-Logging	<ul> <li>Adequate number of CD structures. Additional culverts also proposed.</li> <li>CD structures designed for 50 year return period.</li> <li>Water ways of bridges and culverts have been increased.</li> <li>Roadside drains also provided</li> <li>Embankment height raised along low lying/</li> </ul>	IRC:34 Recommendat ions for road construction in waterlogged area and IRC: 75 and MORT&H guidelines for Design of High Embankments	Reconstruction (4 nos. slab culverts 18 HPC culverts) and 20 nos. of additional new HPC culverts.  Footpath cum covered drains in built-up sections.	MI: Monitoring overtopping/ flooding w.r.t design, functioning and numbers in accordance with site needs.	Review of design documents and drawings and comparison with site conditions	Covered under costs for DPR consultants and PPTA consultants	Design Consultant	PMC/RPW D-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	potential water-logged areas.  Improvement in existing culverts through increase in vent size or retrofitting's. Longitudinal Drains designed so that runoff resulting from storms to a specified frequency of occurrence can be drained off immediately without overflowing or not being impounded in lower level of the Project Area and market areas.		RWH at every 2000 m in a staggered manner in the entire project length.	PT: Standard Design and required numbers of				
2.3. Earthquake	Relevant IS codes shall be adopted in designing the structures to sustain the magnitude of earthquake corresponding to Seismic zone of the project area	Dislodgement of superstructure shall be taken as per Clause 222 of IRC:6.	Entire Stretch	MI: Integrity of proposed structures like bridges, culverts and others.  PT: Design conforms BIS and IRC guidelines.	documents and drawings and comparison with site	F/S consultant, Detailed design cost to be borne by concessional re	Design Consultant	PMC/RPW D-PIU- PPP
2.4. Drought	Ensure water availability for compaction work and consolidation of sub- structure	IRC:78-2000 Standard Specifications and Code of Practice for Road Bridges	Entire Stretch	MI: Monitoring GW levels, public consultations	Design and drawings of foundations, substructure and	Covered under F/S consultant cost	Design Consultant	PMC/RPW D-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
				with local communities.  PT: Water availability and scarcity in the region and d/s of waterways.	superstructur e of structures			
2.5. Forest Fires	<ul> <li>Measures to avoid accident followed by fuel spills.</li> <li>Removal of maintenance slash or management by controlled burning.</li> <li>Plant fire-resistant species in RoW</li> <li>Thinning slashing during non-dry season.</li> <li>No construction camp within 500m of Notified Forest Areas.</li> </ul>	Design requirement	There is no forest along proposed road.	MI: Monitoring of likely damage to roadside flora and spillage/ fuel accumulation induced accident.  PT: Zero incidence of forest fires.		Covered under F/S consultant cost	Design Consultant	PMC/RPW D-PIU- PPP
3.1. livelihood loss to affected persons	Road improvement work to be accommodated within available ROW to the extent possible.     Minimize resettlement impact due to heavily congested built-up section     Social Impact Assessment and Resettlement Plan to be undertaken as per	The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation And Resettlement Act, 2013 and ADB's involuntary	Refer SIA/RAP for more details	MI: Payment of compensatio n and assistance to DPs as per RP  Number of complaints/gr ievances related to compensatio	Check LA records; design drawings vs land plans; Interview with affected persons Check status of employment given to local	Part of administrativ e and resettlement costs	RPWD and implementing NGO	PMC/RPW D-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	national policy and ADB' guidelines.  Complete all necessary land and property acquisition procedures prior to the commencement of civil work.  Adhere to the Land Acquisition procedures in accordance to RP's Entitlement Framework.  Compensation and assistance as per project Resettlement Plan  Income restoration as per RP  Preference in employment and petty contracts during construction to APs  Constitute GRC as per RP	resettlement policy.  Contract Clause for preference to local people during employment.		n and resettlement PT: Minimal number of complaints/gr ievances. All cases of resettlement and rehabilitation if any are resolved at GRC level. No case referred to arbitrator/court.	people during construction			
	rest Land and Cutting of Tree						1	1
4.1. Need for cutting of trees and diversion of forest land	<ul> <li>Geometric adjustments to minimize tree cutting and diversion of forest land</li> <li>Obtain tree cutting permission from forest department</li> <li>Provision for mandatory compensatory afforestation (1:3) for deposit of payment to Forestry Department</li> </ul>	Forest Conservation Act, 1980	Forest Diversion = Nil Total number of affected trees= 269 (Churu- Taranagar Section), 2745 ( Taranagar- Nohar Section), Nos.3014  Mandatory compensatory	MI: Monitoring number and location of geometric adjustments made to avoid forestland and tree cutting, budget amount	Review final design. Check budget provision for compensator y afforestation Onsite validations of plantations carried out.	Covered under preliminary design preparation by F/S consultant  Detailed design cost to be borne by EPC Contractor	RPWD, Design cousulant	PMC/RPW D-PIU

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	Provision for additional compensatory plantation on 1:3 bases to be implemented by concessionaire		plantation in 1:3 ratio Overall, EPC Contractor shall plant at least 20000 saplings as compensatory afforestation as per Schedule-C.	allocated for compensator y afforestation and additional plantation.  PT: Avoiding or bare minimum tree felling on Govt. land/forest/ private land.				
5. Shifting of Utili			T	T	<u> </u>	1	1	
5.1. Disruption of utility services to local community	<ul> <li>All telephone and electrical poles/wires and underground cables should be shifted before start of construction</li> <li>Necessary permission and payments should be made to relevant utility service agencies to allow quick shifting and restoration of utility services</li> <li>Local people must be informed through appropriate means about the time of shifting of utility structures and potential disruption of services if any</li> </ul>	Project requirement	Throughout the corridor	MI: Number of complaints from local people, number, timing and type of notifications issued to local people, time taken to shift utilities PT: No. of complaints should be 0. Minimal time for utility shifting Checklists based monitoring	Interaction with concerned utility authorities and local public	Included under RPWD's costs	EPC Contractor/ RPWD/utility company	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
B. Construction S			•			•	•	
1. Preparatory ac					1	1	T-	
1.1 Preparatory activities	Submit appointment letter and resume of the EPC Contractor's Environmental Focal Person (EFP) to PMU     EFP will engage PMC Environment Specialist and PMU Safeguard Officer-Environment to a meeting to discuss in detail the EMP, seek clarification and recommend corresponding revisions if necessary     EFP will prepare implementation schedule of the approved EMP, EMoP, and agreements reached during the meeting with PMC-ES and PMU-SOE     EFP will consult Environmental Safeguard Implementation Manual and will apply monthly monitoring formats (Checklists) and establish deadlines for submission in consultations with ES(PMC) and ES (AE).     EFP will submit for PMC-ES approval an action plan to secure all permits	Project requirement	Project Office, EPC Contractor's construction camp	Approvals, attendance Checklists based monitoring	PMC accomplishm ent report	Part construction cost for Contractor and PMC Contract	EPC Contractor/ RPWD-PPP- PIU	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	and approvals needed to be secured during construction stage which include but not limited to: i) operation of crushers and hot mix plants, ii) transport and storage of hazardous materials (e.g. fuel, lubricants, explosives), iii) waste disposal sites, iv) temporary storage location, iv) water use, and v) emission compliance of all vehicles. Arrangements to link with government health programs on hygiene, sanitation, and prevention of communicable diseases will also be included in the action plan.  • EFP will submit for approval of PMC-ES the construction camp layout before its establishment.							
1.2 Site induction	<ul> <li>No works will be initiated by the EPC contractor until the site induction training is carried out by the PMC</li> <li>Site induction training includes but not limited to: i) discussion and review of EMP and EMoP detailing how specific</li> </ul>	Project requirement	Conference/Me eting Room in construction camp of EPC Contractor or any other suitable place, adequately big enough in aerial size for	Approvals, attendance Checklists based monitoring	PMC accomplishm ent report	Part construction cost for Contractor and PMC Contract	EPC Contractor/ RPWD-PPP- PIU	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	environmental risks associated with their Scope of Work will be managed legal compliance, inspection and audits, and progress tracking and reporting; ii) environmental training and awareness needs shall be determined and documented via a training needs analysis prior to commencement; iii) Health and Safety Awareness Course, which details general environmental awareness and specific performance requirements expected on site; and iv) GRM and v) compliances to implementation of Community Occupational Safety & Health Plan (COSHP) for prevention and control of spread of COVID-19		observed required social distancing, where Audiovisual facilities for delivering training programmes, can be installed.					
2. Air Quality 2.1 Dust	Concessionaire to submit	MORT&H	Throughout	MI: NAAQS	Standards	Included in	EPC	AE/PMC/R
Generation due to constructio3n activities and transport, storage and handling of	location and layout plan for storage areas of construction materials agreed by PD-PPP-PIU-RPWD and TL (AE).  Transport, loading and unloading of loose and	Specifications for Road and Bridge works Air (P and CP) Act 1974- Sunsequent	project corridor as required during construction activities, Human Habitation	Limits, Complaints from locals due to dust.	CPCB methods	civil works cost	Contractor	PWD-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
construction materials	fine materials through covered vehicles.  Paved approach roads.  Storage areas to be located downwind of the habitation area.  Water spraying on earthworks, unpaved haulage roads and other dust prone areas.  Provision of PPEs to workers.	Amendments and Central Motor and Vehicle Act 1988 General Conditions of Bid Document,	during commencemen t of construction activities in Gajsar, Sahjoosar, Ginri Patta Lohsana, Bhairoosar , Chalkoi Baneerotan, Anandsinghpur a, Taranagar Bhalau Tal, Bhanin, Dheerwas Bara, Sahwa, Khopran, Meghana, Durjana, Durjana, Dalpatpura, Nohar.Chainag es of both habitations and schools are given in Section 15 of Schedule-A). These locations will remain as it is.	PT: Compliances to NAAAQS Number of complaints should be zero.	Review of monitoring data maintained by EPC contractor			
2.2 Emission of air pollutants (HC, SO2, NOX, CO etc) from vehicles	<ul> <li>Regular maintenance         of machinery and         equipment.</li> <li>Batching, asphalt mixing         plants and crushers at</li> </ul>	The Air (Prevention and Control of Pollution) Act, 1981 and	Asphalt mixing plants, crushers, DG set's locations, Human	MI: Levels of HC, SO2, NO2, and CO. Status of	Standards CPCB methods	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
due to traffic congestion and use of equipment and machinery	downwind (1km) direction from the nearest settlement.  Only crushers licensed by the PCB shall be used.  DG sets with stacks of adequate height and use of low Sulphur diesel as fuel.  LPG should be used as fuel source in construction camps instead of wood  Ambient air quality monitoring.  Contractor to prepare traffic management and dust suppression plan duly approved by PD-PIU-PPP-RPWD after review by TL (AE).  Periodic pollution checking of all vehicles and obtaining of Pollution Under Control Certificates (PUCs) and their renewal at required periods of time.	applicable subsequent Amendments.	Habitation during construction activities in Gajsar, Sahjoosar, Ginri Patta Lohsana, Bhairoosar, Chalkoi Baneerotan, Anandsinghpur a, Taranagar Bhalau Tal, Bhanin, Dheerwas Bara, Sahwa, Khopran, Meghana, Durjana, Dalpatpura, Nohar.(Chaina ges of both habitations and schools are given in Section 15 of Schedule-A).These locations will remain as it is.	PUC certificates  PT: Compliances to NAAQS. PUC certificates of equipment and machinery's is up to date.	Review of monitoring data maintained by EPC contractor			
3. Noise and Vibra	ation	<u> </u>	101114111 45 11 15.	<u> </u>	1	<u> </u>		1
3.1 Disturbance to local residents and sensitive receptors due	<ul> <li>All equipment to be timely serviced and properly maintained.</li> <li>Construction equipment and</li> </ul>	· · ·		night Noise levels.	As per Noise rule, 2000 UNI 9916 "Criteria for		EPC Contractor	AE/PMC/R PWD-PIU- PPP

Environmental Issue/Component   Remedial Measure   Iaws/guidelin   Location   Castion   Remedial Measure   Iaws/guidelin   Location   Remedial Measure   Iaws/guidelin   Location   Remedial Measure   Iaws/guidelin   Remedial Measure   Iaws/guidelin   Remedial Measure   Iaws/guidelin   Iams/guidelin   Iaws/guidelin   Iaws/guidelin   Iaws/guidelin   Iams/guidelin   Iaws/guidelin   Iaws/guidelin   Iaws/guidelin   Iams/guidelin   Iaws/guidelin   Iaws/guidelin   Iaws/guidelin   Iaws/guidelin   Iaws/guidelin   Iaws/guidelin   Iaws/guidelin			Reference to		Monitoring indicators		Institut Respons	
noise from construction activities and operation of equipment and machinery  Nolly IS approved equipment shall be used tor construction activities shall be done during night time and weekend near schools, operations intermittently to reduce the total noise generated  Manage existing traffic to avoid traffic jams and accumulation of noise beyond standards.  Restrict construction near residential, built up and forest areas construction to day light hours.  Conduct condition surveys of all properties within 25 meters from road edge  Vibration monitoring during neavy machinery equipment operation  Honking restrictions near experiments and operation of equipment acquirment shall be used to equipment shall be used to complaints or on roapeated to meters and nearschools an earschools an earschools and near clause No 501.8.6. MORT&H Sahilotations, Sahijoosar, Chalkoi, Banierosar, Chalko			laws/guidelin		(MI)/ Performanc e Target		Implementati	Supervisi on/Monito
PPEs to workers     Noise monitoring as per EMoP.  Land and Soil	noise from construction activities and operation of equipment and machinery	with silencers and maintained properly.  Only IS approved equipment shall be used for construction activities.  Timing of noisy construction activities shall be done during night time and weekend near schools,  Implement noisy operations intermittently to reduce the total noise generated  Manage existing traffic to avoid traffic jams and accumulation of noise beyond standards.  Restrict construction near residential, built up and forest areas construction to day light hours.  Conduct condition surveys of all properties within 25 meters from road edge  Vibration monitoring during heavy machinery/equipment operation  Honking restrictions near sensitive areas.  PPEs to workers  Noise monitoring as per	and amendments thereof + Clause No 501.8.6. MORT&H Specifications for Road and Bridge works DIN 4150 and BS 7385.	sensitive locations as nearschools and Habitations, Gajsar, Sahjoosar, Ginri Patta Lohsana, Bhairoosar , Chalkoi Baneerotan, Anandsinghpur a, Taranagar Bhalau Tal, Bhanin, Dheerwas Bara, Sahwa, Khopran, Meghana, Durjana, Durjana, Dalpatpura, Nohar(Chainag es of both habitations and schools are given in Section 15 of Schedule- A).These	PT: Zero complaints or no repeated complaints by local people. Average day and night time noise levels are within permissible limits for work	assessing the effects of vibration on buildings"  DIN 4150 BS 7385  Consultation with local people  Review of noise level monitoring data maintained by contractor  Observation of construction		

		Reference to i	Monitoring indicators			Institut Respons		
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
4.1 Land use Change and Loss of productive / topsoil	<ul> <li>Non-agricultural areas to be used as borrow areas to the extent possible.</li> <li>If using agricultural land, top soil to be preserved and laid over either on the embankment slope for growing vegetation to protect soil erosion.</li> <li>Land for temporary facilities like construction camp, storage areas etc. shall be brought back to its original land use</li> </ul>	Project requirement, Applicable ADB and IRC Guidelines	Throughout the project section and borrow areas  Land identified for camp, storage areas etc.	MI: Borrow pit locations/Top soil storage area, Compliances with Applicable ADB and IRC Guidelines PT: Zero complaints or disputes registered against contractor by land owner	Review borrow area plan, site visits	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP
4.2 Slope failure and Soil erosion due to Construction activities, earthwork, and cut and fill, stockpiles etc.	<ul> <li>Bio-turfing of embankments to protect slopes.</li> <li>Slope protection by providing</li> <li>frames, dry stone pitching, masonry retaining walls, planting of grass and trees.</li> <li>Side slopes of all cut and fill areas will be graded and covered with stone pitching, grass and shrub as per design specifications. Care should be taken that the slope gradient shall not be greater than 2:1.</li> <li>The earth stockpiles to be provided with gentle slopes to soil erosion.</li> </ul>	IRC: 56 -1974 recommended practice for treatment of embankment slopes for erosion control Clause No. 306 and 305.2.2 MORT&H Specifications for Road and Bridge works Guidelines IX for Soil erosion	Throughout the entire project road for example retaining walls/ toe walls are proposed. Slope protection events has been proposed with stone pitching at various near sites.	MI: Occurrence of slope failure or erosion issues. PT: No slope failures. Minimal erosion issues	Review of design documents and site observation	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
4.3 Borrow area management	<ul> <li>Non-productive, barren lands, upland shall be used for borrowing earth with the necessary permissions/consents.</li> <li>Depths of borrow pits to be regulated and sides not steeper than 25%.</li> <li>Topsoil to be stockpiled and protected for use at the rehabilitation stage.</li> <li>Transportation of earth materials through covered vehicles.</li> <li>Follow IRC recommended practice for borrow pits (IRC 10: 1961) for identification of location, its operation and rehabilitation</li> <li>Borrow areas not to be dug continuously.</li> <li>To the extent borrow areas shall be sited away from habituated areas.</li> <li>Borrow areas shall be leveled with salvaged material or other filling materials which do not pose contamination of soil. Else, it shall be converted into fish pond.</li> <li>EPC Contractor to submit copies of STPs/Land Owners Consent Letters.</li> </ul>	IRC Guidelines on borrow areas and for quarries (Environmenta I protection Act and Rules, 1986; Water Act, Air Act)+Clause 305.2.2 MORTH Specifications for Road and Bridgeworks, Applicable ADB and IRC Guidelines for Borrow Areas management	Borrow sites /locations	MI: Existence of borrow areas in inappropriate unauthorized locations. Poor borrow area management practices. Number of accidents. Complaints from local people.  PT: No case of noncompliance with Applicable ADB and IRC Guidelines. Zero accidents. Zero accidents. Zero complaints No use of black cotton soil. Checklists based monitoring	Review of design documents and site observations	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
4.4 Borrow area management	<ul> <li>Non-productive, barren lands, upland shall be used for borrowing earth with the necessary permissions/consents.</li> <li>Depths of borrow pits to be regulated and sides not steeper than 25%.</li> <li>Topsoil to be stockpiled and protected for use at the rehabilitation stage.</li> <li>Transportation of earth materials through covered vehicles.</li> <li>Follow IRC recommended practice for borrow pits (IRC 10: 1961) for identification of location, its operation and rehabilitation</li> <li>Borrow areas not to be dug continuously.</li> <li>To the extent borrow areas shall be sited away from habitat areas.</li> <li>Borrow areas shall be levelled with salvaged material or other filling materials which do not pose contamination of soil. Else, it shall be converted into fish pond.</li> <li>EPC Contractor to submit copies of STPs/ Land Owners Consent Letters.</li> </ul>	IRC Guidelines on borrow areas and for quarries (Environmenta I protection Act and Rules, 1986; Water Act, Air Act) + Clause 305.2.2 MORTH Specifications for Road and Bridgeworks, Applicable ADB and IRC Guidelines for Borrow Areas management	Borrow Area sites	MI: Existence of borrow areas in inappropriate unauthorized locations. Poor borrow area management practices. Numtestesbe r of accidents. Complaints from local people.  PT: No case of noncompliance with applicable ADB and IRC Guidelines. Zero accidents. Zero complaints No use of black cotton soil	Review of design documents and site observations	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
4.5 Quarry Operations	<ul> <li>Aggregates will be sourced from existing licensed quarries.</li> <li>Copies of consent/approval / rehabilitation plan for a new quarry or use of existing source will be submitted to RPWD.</li> <li>The contractor will develop a Quarry Redevelopment plan, as per the Mining Rules of the state and submit a copy of the approval to EA.</li> <li>Obtain environmental clearance from SEIAA /DEIAA in case of opening new quarry.</li> </ul>	Clause No.111.3 MORT&H Specifications for Road and Bridge works Guidelines VI for Quarry Areas Management Environmental Protection Rules	New Quarry if needed and existing Quarries	MI: Existence of licenses quarry areas from which materials to be sourced and Existence of a quarry redevelopme nt plan  PT: Quarry license is valid.: No case of noncompliance to consent conditions and air quality meets the prescribed limit	Review of design documents, contractor documents and site observation Compliance to EC conditions in case of opening new quarries	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP
4.6 Compaction of soil and impact on quarry haul roads due to movement of vehicles and equipment	<ul> <li>Construction vehicles, machinery, and equipment to be stationed in the designated ROW to avoid compaction.</li> <li>Approach roads/haulage roads shall be designed along the barren and hard soil area to reduce the compaction.</li> <li>Transportation of quarry material to the dumping</li> </ul>	Design requirement	Parking areas, Haulage roads and construction yards.	MI: Location of approach and haulage roads Presence of destroyed/compacted agricultural land or land which has not been restored to its original	Site observation	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
4.7 Contamination	site through heavy vehicles shall be done through existing major roads to the extent possible to restrict wear and tear to the village/minor roads.  • Land taken for construction camp and other temporary facility shall be restored to its original conditions.	Dogigo	Eugling station	condition PT: Zero occurrence of demolished/ compacted land and undemolishe d land.	Cito	Ingluded in	EDC	AE/DMC/D
4.7 Contaminatio n of soil due to leakage/ spillage of oil, bituminous and non- bituminous debris generated from demolition and road construction	<ul> <li>Construction         vehicles and         equipment will be         maintained and refueled         in such a fashion that         oil/diesel spillage does         not contaminate the soil.</li> <li>Fuel storage and         refueling sites to be kept         away from drainage         channels.</li> <li>Unusable debris shall         be dumped in ditches and         low lying areas.</li> <li>To avoid soil         contamination Oil-         Interceptors shall be         provided at wash down         and refueling areas.</li> <li>Waste oil and oil soaked         cotton/ cloth shall be         stored in containers         labeled 'Waste Oil' and         'Hazardous' sold off to</li> </ul>	Design requirement	Fueling station, construction sites, and construction camps and disposal location.	MI: Quality of soil near storage area Presence of spilled oil or bitumen in project area  PT: Soil test conforming to no — contaminatio n. No sighting of spilled oil or bitumen in construction site or camp site Checklists based monitoring	Site observation	Included in civil work cost.	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to laws/guidelin e		Monitoring indicators			Institutional Responsibility	
Environmental Issue/Component	Remedial Measure		Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
5. Water Resource 5.1 Sourcing of water during Construction	MoEF/SPCB authorized vendors  Non-bituminous wastes to be dumped in borrow pits with the concurrence of landowner and covered with a layer of topsoil conserved from opening the pit. Bituminous wastes will be disposed off in an identified dumping site approved by the State Pollution Control Board  es  Requisite permission shall be obtained for abstraction of groundwater from Central Groundwater Authority. Arrangements shall be made by EPC contractor that the water availability and supply to nearby communities remain unaffected. Water intensive activities not to be undertaken during summer season. Provision of water harvesting structure to augment recharging of groundwater conditions (aquifers) in the project area.	CGWA Guidelines	Throughout the Project section  Water harvesting structure at toll plazas	MI: Approval from competent authority Complaints from local people on water availability  PT: Valid approval from competent authority. Zero complaints from local people. Checklists based monitoring	Checking of documentation  Talk to local people	Included in civil work cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to laws/guidelin e Location	Monitoring indicators			Instituti Respons		
Environmental Issue/Component	Remedial Measure		Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	<ul> <li>Permissions from Local Irrigation Department, in case using canal water.</li> <li>Agreement letters with local level water suppliers.</li> </ul>							
5.2 Disposal of water during construction	<ul> <li>Provisions shall be made to connect road side drains with existing nearby natural drains.</li> <li>All hand pumps and wells are proposed for relocation at suitable locations in consultation with local community.</li> <li>Water harvesting structures have been proposed along the project road subject to technical feasibility as per guidelines of CGWB. These measures will significantly augment the ground water/surface water availability in the area</li> </ul>	Clause No.1010 EP Act 1986 MORT&H Specifications for Road and Bridgeworks	Throughout the Project section There is no water body along the alignment.	MI: Condition of drainage system in construction site. Presence /absence of water logging in project area.  PT: Existence of proper drainage system. No water logging in project area	Standards methods Site observation and review of documents	Included in civil work cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP
5.3 Alteration in surface water hydrology	<ul> <li>Existing drainage system to be maintained and further enhanced.</li> <li>Provision shall be made for adequate size and number of cross drainage structures esp. in the areas where land is</li> </ul>	Design requirement, Clause No 501.8.6. MORT&H Specifications for Road and Bridge	Near all drainage channels, river/ nallah crossings etc. There is no water body along the alignment.	MI: Proper flow of water in existing streams and rivers  PT: No complain of water shortage by	Review of design documents  Site observation	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	sloping towards road alignment.  Road level shall be raised above HFL level wherever road level is lesser than HFL.  No construction will be established within 500mts of a water body.  Culverts reconstruction shall not be done during lean flow period. In some cases these minor channels may be diverted for a very short period (15-30 days) and will be bring back to its original course immediately after construction.  The design of drainage system such as surface and sub-surface drainage will be carried out as per IRC: SP: 42 and IRC: SP: 50. Surface runoff from the main highway, embankment slopes and the service roads will be discharged through longitudinal drains, designed for adequate cross section, bed slopes, invert levels and the outfalls. If necessary, the walls of the drains will be designed to retain the adjoining earth.			downstream communities. No record of overtopping/ water logging Checklists based monitoring				

		Reference to		Monitoring indicators		Mitigation Costs	Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods		Implementati on	Supervisi on/Monito ring
	<ul> <li>The design discharge will be evaluated for flood of 50-year return period for calculation of waterway and design of foundations. Proposed water way will not be reduced from existing one. Linear waterways of the</li> <li>The design of drainage system such as surface and sub-surface drainage will be carried out as per IRC: SP: 42 and IRC: SP: 50. Surface runoff from the main highway, embankment slopes and the service roads will be discharged through longitudinal drains, designed for adequate cross section, bed slopes, invert levels and the outfalls. If necessary, the walls of the drains will be designed to retain the adjoining earth.</li> <li>The design discharge will be evaluated for flood of 50-year return period for calculation of waterway and design of foundations. Proposed water way will not be reduced from existing one. Linear waterways of</li> </ul>							

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	the most of the major rivers are bank to bank. Therefore, proposed bridge length will be bank to bank.  • The design of drainage system such as surface and sub-surface drainage will be carried out as per IRC: SP: 42 and IRC: SP: 50. Surface runoff from the main highway, embankment slopes and the service roads will be discharged through longitudinal drains, designed for adequate cross section, bed slopes, invert levels and the outfalls. If necessary, the walls of the drains will be designed to retain the adjoining earth.  • The design discharge will be evaluated for flood of 50-year return period for calculation of waterway and design of foundations. Proposed water way will not be reduced from existing one. Linear waterways of the most of the major rivers are bank to bank. Therefore, proposed bridge length will be bank to bank.							

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
5.4 Siltation in water bodies due to construction activities /earthwork	<ul> <li>Embankment         slopes to be modified         suitably to restrict the soil         debris entering water         bodies.</li> <li>Provision of Silt fencing         shall be made at water         bodies.</li> <li>Silt/sediment should be         collected and stockpiled         for possible reuse as         surfacing of slopes where         they have to be re-         vegetated.</li> <li>Earthworks and stone         works to be prevented         from impeding natural         flow of rivers, streams         and water canals or         existing drainage system.</li> <li>Retaining walls at water         bodies /ponds to avoid         siltation near ponds.</li> <li>No construction camp         within 500m of any water         body</li> <li>Locate all parking, repair         and fuel and hazardous         material storage area         away from any water         body. Vehicle parking         and maintenance areas         will have waterproof         floors from which         drainage is collected and         treated to legal         standards.</li> </ul>	Design requirement, ClauseNo501. 8.6.MORT&H Specifications for Road and Bridgeworks  Worldwide best practices	Near all waterbodies /waterway.Ther e is no water body along the alignment.	MI: Presence /absence of siltation in rivers, streams, ponds and other water bodies in project area. Turbidity test levels  PT: No records of siltation due to project activities. Surface water quality tests confirm to turbidity and TSS limit	Field observation	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring indicators			Instituti Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e Lo	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	<ul> <li>Refuel vehicles only in dedicated areas with waterproof floors from which drainage flows to an oil/water separator before discharge</li> </ul>							
5.5 Deterioration in Surface water quality due to leakage from vehicles and equipment and waste from construction camps.	<ul> <li>No vehicles or equipment should be parked or refueled near waterbodies, so as to avoid contamination from fuel and lubricants.</li> <li>Oil and grease traps and fueling platforms to be provided at re-fueling locations.</li> <li>All chemicals and oil shall be stored away from water and concreted platform with catchment pit for spills collection.</li> <li>All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up. Readily available, simple to understand and preferably written in the local language emergency response procedure, including reporting, will be provided by the contractors.</li> </ul>	The Water (Prevention and Control of Pollution) Act, 1974 and amendments thereof./ as well as IS-10500:2012	Water bodies, refueling stations, construction camps. There is no water body along the alignment.	MI: Water quality of ponds, streams, rivers and other water bodies in project  Presence of oil floating in water bodies in project area  PT: Surface water quality meets freshwater quality standards prescribed by CPCB Checklists based monitoring	Conduction of water quality tests as per the monitoring plan  Field observation	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	<ul> <li>Construction camp to be sited away from water bodies. No construction camp within 500mts of water body.</li> <li>Wastes must be collected, stored and taken to approve disposal site only.</li> <li>Water quality shall be monit</li> <li>Locate all parking, repair and fuel and hazardous material storage area away from any water body. Vehicle parking and maintenance areas will have waterproof floors from which drainage is collected and treated to legal standards.</li> <li>Refuel vehicles only in dedicated areas with waterproof floors from which drainage flows to an oil/water separator before discharge.</li> </ul>							
6. Flora and Faun						I	I	
6.1 Vegetation loss due to site preparation and construction activities	<ul> <li>Restrict tree cutting up to toe line considering safety to road users.</li> <li>Roadside trees to be removed with prior approval of competent authority.</li> </ul>	Forest Conservation Act1980 + IRC:SP:21 and IRC:SP:66	Throughout project corridor  Estimated No. of affected tree=269 (Churu-Taranagar	MI: ROW width Number of trees for felling Compensator y plantation plan	Review of relevant documents – tree cutting permit, compensator y plantation plan. and	Mandatory Compensato ry afforestation cost is included in project costs	Mandatory Compensator y plantation maintained by EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	<ul> <li>Mandatory compensatory plantation at 1:3 basis by Forestry Department</li> <li>Additional plantation on 1:3 basis as per the IRC guidelines to be carried out by EPC Contractor.</li> <li>Regular maintenance trees planted.</li> <li>Provision of LPG in construction camp as fuel source to avoid tree cutting.</li> <li>Plantation of trees on both sides of the road where technically feasible. Trees should be offset 1m back from the ultimate edge of the roadway to prevent safety hazard and provide adequate sight distance.</li> <li>Integrate vegetation management (IVM) with the carriage way completely clear of vegetation.</li> <li>Controlled use of pesticides/ fertilizers</li> </ul>		Road) and 2745 (Taranagar-Nohar Road),  Compensatory Plantation on1:3 basis.  EPC Contractor shall do 20000 nos. of sapling plantations as per Schedule-C.	Number of trees replanted.  PT: Compensator y afforestation done on a 1:3 basis by EPC Contractor. Checklists based monitoring	additional plantation strategy Field observations	under RPWD		
7. Construction C								
7.1 Impact associated with location	All camps should be established with prior permission from PCB. Camps to maintain	Design Requirement As identified in IEE, All applicable	Construction camp	MI: Location of campsites and distance from habitation,	On site observation  Interaction with workers	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	minimum distance from following:  # 500 m from habitation  # 500 m from forest areas where possible  # 500 m from water bodies where possible  # 500 m from through traffic route  # 500 m from identified wildlife crossing areas  # 500 m within a waterbody	laws, rules and regulations including Contract Labour laws as well as, EHS policy and rules.		forest areas, water bodies, through traffic route and construction camps PT: Distance of campsite is less than 500m from listed locations	and local community  Checklists based monitoring			
7.2 Worker's Health in construction camp	The location, layout and basic facility provision of each labor camp will be submitted to AE and approved by PD-PIU-PPP-RPWD. The EPC contractor will maintain necessary living accommodation and ancillary facilities in hygienic manner.  Adequate water and sanitary latrines with septic tanks with soak pits shall be provided.  Preventive medical facilities in camp  Waste disposal facilities such as dust bins must be provided in the camps and regular disposal of waste The EPC Contractor will take all	The Building and Other Construction workers (Regulation of Employment and Conditions of service) Act 1996 and The Water (Prevention and Control of Pollution) Act, 1974 and amendments thereof	All construction camps	MI: Camp health records, Compliance to SOPs of COSHP for COVID-19 Protection.  Existence of proper first aid kit in camp site  Complaints from workers.  PT: No record of illness due to unhygienic conditions or vectors. Zero	Camp records  Site observation  Consultation with contractor workers and local people living nearby	Part of the civil works costs	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	precautions to protect the workers from insect and pest to reduce the risk to health. This includes the use of insecticides which should comply with local regulations.  No liquor or prohibited drugs will be imported to, sell, give and barter to the workers of host community.  Awareness raising to immigrant workers/local community on communicable and sexually transmitted diseases.  Compliance to SOPs of COSHP for COVID-19 Protection.			cases of STD. Clean and tidy camp site conditions. Compliance to SOPs of COSHP for COVID-19 Protection. Checklist based monitoring				
	Construction Waste/Debris		l a	I	I =			1.5/0140/0
8.1 Selection of Dumping Sites	<ul> <li>Contractor to submit a waste/spoil disposal plan and get it approved by AE and PD-PIU-PP-RPWD.</li> <li>Create controlled dumping sites with a non-permeable lining incorporated in the pit design to avoid leachate seepage into the soil, which may later affect ground water quality</li> <li>Unproductive/wastelands shall be selected for</li> </ul>	Design Requirement, MORT&H guidelines and General Conditions of Contract Document, Construction and Demolition Waste Management Rules-2016 and	At all Dumping/Dispo sal Sites	MI: Location of dumping sites Number of public complaints.  PT: No public complaints.  Consent letters for all dumping sites available with contractor	Field survey and interaction with local people. Review of consent letter	Included in civil works cost.	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	dumping sites away from residential areas and water bodies  Dumping sites must be having adequate capacity equal to the number of debris generated.  Public perception and consent from the village Panchayats has to be obtained before finalizing the location.	subsequent Amendments.		Checklists based monitoring				
8.2 Reuse and disposal of construction and dismantled waste	<ul> <li>The existing bitumen surface shall be utilized for paving of cross roads, access roads, and paving works in construction sites and camps, temporary traffic diversions, and haulage routes.</li> <li>All excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping.</li> <li>Unusable and non-bituminous debris materials should be suitably disposed off at pre-designated disposal locations, with approval of the concerned authority.</li> </ul>	Design Requirement, MORT&H guidelines and General Conditions of Contract Document  Construction and Demolition Waste Management Rules 2016 and subsequent Amendments.	Throughout the project corridor	MI: Percentage of reuse of existing surface material  Method and location of disposal site of construction debris  PT: No public complaint and consent letters for all dumping sites available with contractor or AE.	Contractor records  Field observation  Interaction with local people	Included in civil works cost.		

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
9. Traffic Manage	The bituminous wastes shall be disposed in secure landfill sites only in environmentally accepted manner. For removal of debris, wastes and its disposal, MORTH guidelines should be followed.  Unusable and surplus materials, as determined by the Project Engineer, will be removed and disposed off-site.			Checklists based monitoring				
9.1 Management of existing traffic and safety	<ul> <li>Traffic Management Plan shall be submitted by the contractor and approved by the AE</li> <li>The traffic control plans shall contain details of diversions; traffic safety arrangements during construction; safety measures for night time traffic and precautions for transportation of hazardous materials. Timing and scheduling to be done so that transportation of dangerous goods is done during least number of people and other vehicles on the road.</li> <li>The Contractor will ensure that the</li> </ul>	Design requirement and IRC: SP: 27 - 1984, Report Containing Recommendat ion of IRC Regional Workshops on Highway Safety IRC:SP: 32 - 1988 Road Safety for Children (5-12 Years Old) in Construction Zones IRC:SP:55-2014	Throughout the project corridor especially at intersections.	MI: Traffic management plan. Presence/ absence of safety signs, traffic demarcations , flag men etc. on site. Complaints from road users. No of accidents PT: No complaints. No accidents due to poor traffic management . Traffic	Review traffic management plan Field observation of traffic management and safety system  Interaction with people in vehicles using the road	Included in civil works cost.	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Poforonoo to		Monitoring			Institut	
Environmental Issue/Component	Remedial Measure	Reference to laws/guidelin e	Location	indicators (MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Respons Implementati on	Supervisi on/Monito ring
	diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.  On stretches where it is not possible to pass the traffic on the part width of existing carriageway, temporary paved diversions will be constructed. Restriction of construction activity to only one side of the existing road The contractor shall inform local community of changes to traffic routes, and pedestrian access arrangements with assistance from "AE". Use of adequate signage's to ensure traffic management and safety. Conduct of regular safety audit on safety measures.	The Building and other Construction workers Act 1996 and Cess Act of 1996 Factories Act 1948+Section 6 of Employer's Requirement of Bid Document		signs, demarcation lines etc. present in appropriate locations on site. Checklists based monitoring				
9.2 Pedestrians, animal movement	<ul> <li>Temporary access and diversion, with proper drainage facilities.</li> <li>Access to the schools, temples and other public places must be maintained when</li> </ul>	Same as above	Near habitation on both sides of schools, temples, construction sites, haulage roads, diversion sites.		Field observation Interaction with local people	Included in civil works cost.	EPC Contractor	AE/PMC/R PWD-PIU- PPP

Environmental		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
9.3 Safety of Workers and accident risk from construction activities	construction takes place near them.  Fencing wherever animal movement is expected.  Large number of box culverts has been proposed. All structures having vertical clearance above 2m and not catering to perennial flow of water may serve as underpass for animals  Contractors to adopt and maintain safe working practices.  Usage of fluorescent and retro refectory signage, in local language at the construction sites  Training to workers on safety procedures and precautions.  Mandatory appointment of safety officer.  All regulations regarding safe scaffolding, ladders, working platforms, gangway, stair wells, excavations, trenches and safe means of entry and egress shall be complied with.	Same as above	Construction sites	Number of complaints from local people  PT: Easy access to schools, temples and public places. Zero complaints Checklists based monitoring  MI: Availability of Safety gears to workers  Safety signage Training records on safety  Number of safety related accidents  PT: Zero fatal accidents. Zero or minor non-fatal accidents.	Site observation Review records on safety training and accidents Interact with construction workers	Included in civil works cost	Obligation of EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
9.4 Accident risk to local community	<ul> <li>Provision of PPEs to workers.</li> <li>Provision of a readily available first aid unit including an adequate supply of dressing materials.</li> <li>The contractor will not employ any person below the age of 18years</li> <li>Use of hazardous material should be minimized and/or restricted.</li> <li>Emergency plan (to be approved by engineer) shall be prepared to respond to any accidents or emergencies.</li> <li>Accident Prevention Officer must be appointed by the contractor.</li> <li>Restrict access to construction sites only to authorized personnel.</li> <li>Physical separation must be provided for movement of vehicular and human traffic.</li> <li>Adequate signage must be provided for safe traffic movement</li> <li>Provision of temporary diversions and awareness to locals</li> </ul>	Same as above	Construction sites	MI: Safety signs and their location, Incidents of accidents, Complaints from local people PT: Zero incident of accidents. Zero complaints.	Site inspection  Consultation with local people	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	before opening new construction fronts.  and rehabilitation			Checklists based monitoring. Checklists based monitoring				
10.1 Clean-up Operations, Restoration and Rehabilitation	<ul> <li>Contractor will prepare site restoration plans, which will be approved by the AE.</li> <li>The clean-up and restoration operations are to be implemented by the contractor prior to demobilization.</li> <li>All construction zones including river-beds, culverts, road-side areas, camps, hot mix plant sites, crushers, batching plant sites and any other area used/affected by the project will be left clean and tidy, to the satisfaction of the Environmental Specialist (PMC), Environmental Specialist (PMC), Environmental Person (EPC Contractor).</li> <li>All the opened borrow areas will be rehabilitated and 'AE' will certify</li> </ul>	Project requirement	Throughout the project corridor, construction camp sites and borrow areas	MI: Condition of camp, borrow areas and construction sites, Presence/ absence of construction material/debr is after completion of construction works on site. PT: Clean and tidy sites. No trash or debris left on site. Site restored and leveled. Checklists based monitoring	Site observation Interaction with locals Issue completion certificate after restoration of all sites are found satisfactory	Included in civil works cost.	EPC Contractor	AE/PMC/R PWD-PIU- PPP
C. Operation and	Maintenance stage							

1. Air Quality

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
1.1 Air pollution due to due to vehicular movement	<ul> <li>Roadside tree plantations shall be maintained at least with 70% survival rate.</li> <li>Regular maintenance of the road will be done to ensure good surface condition</li> <li>Ambient air quality monitoring. If monitored parameters exceeds prescribed limit, suitable control measures must be taken.</li> <li>Signages shall be provided reminding them to properly maintain their vehicles to economize on fuel consumption.</li> <li>Enforcement of vehicle emission rules in coordination with transport department or installing emission checking equipment. Obtaining of Pollution Under Control Certificates (PUCs) and their renewal on periodic basis.</li> </ul>	Environmental Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981, Motor Vehicles Act 1948 and subsequent Amendments	Habitation during commencemen t of	levels given in the IEE	requirements	Included in Operation / Maintenance cost	Implementation Contractor and & monito AE/PMC/RPWI	Supervision ring by

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
2. Noise								
2.1 Noise due to movement of traffic	<ul> <li>Effective traffic management and good riding conditions shall be maintained</li> <li>Speed limitation to 20 km/hour and honking restrictions near sensitive receptors</li> <li>Monitoring of Performance of Noise Barriers constructed and New Construction of any further required noise barriers near sensitive receptors with consent of local community</li> <li>Create awareness amongst the residents about likely noise levels from road operation at different distances, the safe ambient noise limits and easy to implement noise reduction measures while constructing a building near road.</li> </ul>	Noise Pollution (Regulation and Control) Rules, 2000 and amendments thereof	Residential and sensitive locations location s of air quality monitoring. Human Habitation during commencemen t of construction activities in Gajsar, Sahjoosar, Ginri PattaLohsana, Bhairoosar, Chalkoi Baneerotan, Anandsinghpur a, Taranagar BhalauTal, Bhanin, Dheerwas Bara, Sahwa, Khopran, Meghana, Durjana, Dalpatpura(Chainages of both habitations and schools are given in	MI: Noise levels  PT: Levels are equal to or below baseline levels given in the IEE report  Checklists based monitoring	Noise monitoring as per noise rules, 2000  Discussion with people at sensitive receptor sites	Included in Operation / Maintenance cost	Implementation Contractor and & monito AE/PMC/RPWI	Supervision ring by

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
			Section 15 of Schedule-A)					
3. Land and Soil								
3.1 Soil erosion at embankment during heavy rainfall.	Periodic checking to be carried to assess the effectiveness of the stabilization measures viz. turfing, stone pitching, river training structures etc.      Necessary measures to be followed wherever there are failures	Project requirement	At embankment slopes and other probable soil erosion areas.	MI: Existence of soil erosion sites Number of soil erosion sites PT: Zero or minimal occurrences of soil erosion. Checklists based monitoring.	On site observation	Included in Operation / Maintenance cost	Implementation Contractor and & monitor AE/PMC/RPWI	Supervision by
4. Water resource	s/Flooding and Inundation							
4.1 Siltation	Regular checks shall be made for soil erosion conditions for its effective maintenance.	Project requirement	Near surface Water bodies. There is no water body along the alignment.	MI: Water quality  PT: No turbidity of surface water bodies due to the road Checklists based monitoring	Site observation	Included in Operation / Maintenance cost	Implementation Contractor and & monitor AE/PMC/RPWI	Supervision ring by D-PIU-PPP
4.2 Water logging due to blockage of drains, culverts or streams	<ul> <li>Regular visual checks and cleaning (at least once before monsoon) of drains to ensure that flow of water is maintained through cross drains and other channels/streams.</li> </ul>	Project requirement IRC: SP:21- 2009	Near surface Water bodies/cross drains/side drains	MI: Presence/ absence of water logging along the road	Site observation	Included in Operation / Maintenance cost	Implementation Contractor and & monitor AE/PMC/RPWI	Supervision ring by

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
	Monitoring of water borne diseases due to stagnant water bodies			PT: No record of overtopping/ Water logging. Checklists based monitoring				
5. Flora			T <u> </u>	T	1 _	T	T	
5.1 Vegetation	<ul> <li>Planted trees, shrubs, and grasses to be properly maintained.</li> <li>The tree survival audit to be conducted at least once in a year to assess the effectiveness</li> </ul>	Forest Conservation Act 1980	Project tree plantation sites	MI: Tree/plants survival rate PT: Minimum rate of 70% tree survival Checklists based monitoring	Records and field observations. Information from Forestry Department	Included in Operation / Maintenance cost	Implementation Contractor and & monito AE/PMC/RPWI	Supervision ring by
	Right of Way and Safety							
6.1 Accident Risk due to uncontrolled growth of vegetation	<ul> <li>Maintain shoulder completely clear of vegetation.</li> <li>Minimum offset as prescribed in IRC:SP:21-2009 to be maintained</li> <li>Regular maintenance/trimming of plantation along the road side</li> <li>No invasive plantation near the road.</li> </ul>	Project requirement IRC: SP:21- 2009	Throughout the Project route	MI: Presence and extent of vegetation growth on either side of road. Number of accidents. PT: No accidents due to vegetation growth. Checklists based monitoring	Visual inspection  Check accident records	Included in Operation / Maintenance cost	Implementation Contractor and & monito AE/PMC/RPWI	Supervision ring by

		Reference to		Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
6.2 Accident risks associated with traffic movement.	<ul> <li>Traffic control measures, including speed limits, will be enforced strictly.</li> <li>Further encroachment of squatters within the ROW will be prevented.</li> <li>Monitor/ensure that all safety provisions included in design and construction phase are properly maintained</li> <li>Highway patrol unit(s) for round the clock patrolling. Phone booth for accidental reporting and ambulance services with minimum response time for rescue of any accident victims, if possible.</li> <li>Tow-way facility for the breakdown vehicles if possible.</li> <li>Road furniture shall be as per Schedule-C and applicable IRC Codes.</li> <li>Road Safety Audit should be conducted on regular basis</li> </ul>	IRC:SP:55- 2014/And IRC:SP:88- 2010	Throughout the Project route	MI: Number of accidents Conditions and existence of safety signs, rumble strips etc. on the road Presence/ab sence of sensitive receptor structures inside the stipulated planning line as per relevant local law  PT: Fatal and non fatal accident rate is reduced after improvement Checklists based monitoring	Review accident records  Site observations	Included in Operation / Maintenance cost	Implementation Contractor and & monito AE/PMC/RPWI	Supervision ring by
6.3 Transport of Dangerous Goods	<ul> <li>Existence of spill prevention and control and emergency responsive system</li> <li>Emergency plan for vehicles carrying hazardous material</li> </ul>	-	Throughout the project stretch	MI: Status of emergency system – whether operational or not	Review of spill prevention and emergency response plan	Included in Operation / Maintenance cost	Implementation Contractor and & monito AE/PMC/RPWI	Supervision ring by

		Reference to laws/guidelin e		Monitoring indicators	Manitavina		Institutional Responsibility	
Environmental Issue/Component	Remedial Measure		Location	(MI)/ Performanc e Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisi on/Monito ring
				PT: Fully functional emergency system.  Checklists based monitoring	Spill accident records			

EFP: Environmental Focal Person, RPWD: Rajasthan State Public Works Department, NPK: Nitrogen, Phosphorous and Potassium, PMC: Project Management Consultant, AE: Authority Engineer, IEE: Initial Environmental Examination, IRC: Indian Road Congress, DEIAA: District Environmental Impact Assessment Authority, SEIAA: State Environmental Impact Assessment Authority, CPCB: Central Pollution Control Board, IS: Indian Standard

## **ENVIRONMENTAL MONITORING PLAN FOR CHURU-TARANAGAR-NOHAR ROAD**

Env. Indicators	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervisi on/Monito ring
Air Quality	Constructio n stage	PM 10 PM 2.5 SO2, NOX, CO	High volume sampler to be located 50 m from the selected locations in the downwind direction. Use method specified by CPCB	during commencement of construction activities in Gajsar, Sahjoosar, Ginri Patta Lohsana, Bhairoosar Chalkoi Baneerotan,	During Active Construction Phase	Air quality standard by CPCB	110x 9000=Rs.99 0000.00	EPC Contractor through approved monitoring agency	AE/PMC/R PWD-PIU- PPP

Env. Indicators	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervisi on/Monito ring
	Operation stage			construction period. Total No of sample- 48 samples. Total numbers of samples 110 during entire scheduled construction period. No of samples may increase for EOT period. Toll Plaza-3 sample each quarter. Total 12 samples in a year. Human habitations, especially sensitive receptors. 6 samples in each quarter. Total no of 18 samples.	continuous, 3/year for 1 year of operation period (Total 3 times in a year Except Monsoon	Air quality standard by CPCB	30X9000 =Rs 270000.00	EPC Contractor through approved monitoring agency	AE/PMC/R PWD-PIU- PPP
Water Quality	Constructio n stage	Ground water: (IS: 10500:2012) and Surface water criteria for freshwater classification	Grab sample collected from source and analyse as per Standard Methods for Examination of Water and Wastewater	Groundwater at Construction Camps	Season )  3/year till the end of construction activities (Total 3 times in a year baring monsoon), 6 bore well, 6 surface water sample in each quarter.  Minimum 3 samples in each quarter. Total no 90 samples during entire scheduled construction period. No of samples may	Water quality standard by CPCB	90x 5000 = Rs 450000.00	EPC Contractor through approved monitoring agency	AE/PMC/R PWD-PIU- PPP

Env. Indicators	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervisi on/Monito ring
					increase for EOT period.				
	Operation stage			Groundwater at 4 locations and surface water at 4 locations	3/year for 1 year	Water quality standard by CPCB	24x5000=Rs 120000.00	EPC Contractor through approved monitoring agency	AE/PMC/R PWD-PIU- PPP
Noise levels	Constructio n stage	Equivalent Noise levels on dB (A) scale for day and night	CPCB for	Same as air quality Total numbers of samples 70 during entire scheduled construction period. No of samples may increase for EOT period.	During Active Construction Phase	National Ambient Noise Standard specified in Environmen t Protection Act, 1986	110 x1500=Rs.1 65000.00	EPC Contractor through approved monitoring agency	AE/PMC/R PWD-PIU- PPP
	Operation stage		meter	Same as air quality	3/year for 1 year		30x1500=Rs .45000.00	EPC Contractor through approved monitoring agency	AE/PMC/R PWD-PIU- PPP
Soil Quality	Constructio n Stage	NPK (ICAR standard) and heavy metals	As specified by the site engineer RPWD / supervision consultant	Camp, Dumping/storage areas and HMP sites (Total 4 sample locations)	Once during entire construction stage	ICAR standards	4x3000=Rs. 12000.00	EPC Contractor through approved monitoring agency	AE/PMC/R PWD-PIU- PPP
	Operation stage	Oil and grease		At oil spillage locations and other probable soil contamination locations (Total 3 samples)	Once for the first year of operation	ICAR Standards	3x3000=Rs. 9000.00	EPC Contractor through approved monitoring agency	AE/PMC/R PWD-PIU- PPP
Soil Erosion	Constructio n Stage	Visual check for Soil erosion and		Throughout the Project Corridor especially at River	After first rain	Visual Checks	Included in Engineering Cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP
	Operation Stage	siltation		banks, bridge locations and river training structures	Once during operation of 1st year	Visual Checks	Routine Engineering Work	Engineering AE/PMC/RPWD	Team of -PIU-PPP

Env. Indicators	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervisi on/Monito ring
Drainage Congestion	Constructio n stage	Visual Checks		Throughout the Project Corridor especially Probable	Once in a year before rainy season	None Specific	Included in Engineering Cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP
	Operation Stage			drainage congestion areas	Once in a year before rainy season	None Specific	Routine Engineering Work	Engineering Tea AE/PMC/RPWD	-PPP
Borrow Areas- Prior obtaining of ECs for borrow	Constructio n Stage	Visual Checks	IRC guidelines	Borrow areas to be operated	Once in a month	ADB and IRC guidelines	EPC Contractor	EPC Contractor with approval from AE/PIU-RPWD-PPP	AE/PMC/R PWD-PIU- PPP
areas is exempted by MoEFCC	Operation Stage	Visual Checks	Rehabilitation as per IRC guidelines	Closed Borrow Areas	Quarterly for 1 year			EPC Contra approval from RPWD-PPP	n AE/PIU-
Construction Sites and Labor Camp	Constructio n stage	Visual Checks of Hygiene, drainage Medical Facilities Etc.	Rapid audit as per reporting format	Construction Sites and Camp	Quarterly during construction period	IRC guidelines	Part of the regular monitoring	EPC Contractor with approval from AE/RPWD-PIU-PPP	AE/PMC/R PWD-PIU- PPP
Tree Plantation	Constructio n Stage	Visual check be monitoring of tr	ased Surveillance ees felling	Throughout the Project Section	During site clearance in construction phase	As suggested by Forest Dept.	Compensato ry: RPWD Additional Plantation: Provisional sum under	Compensatory: Forest Department Additional Implementation Contractor. Sup Monitoring AE/PMC/RPWD	ents Plantation: by The EPC ervision and by
	Operation stage	Audit for survi plantation	val rate of trees	Throughout the Project Section	Quarterly during Defect Liablity Period		Civil Cost	The AE will be re monitoring up to Liability Perio particular stretc	sponsible for the Defect d in any h. After this WD-PIU-PPP PMC/EPC
Record of Accident	Constructio n Stage	suggested	and cause of lethodology as by IE/Safety d approved by	Throughout the stretch including construction sites, crusher, diversions, HMP, earthwork, demolition site etc.	occurrence of accidents	As suggested by PMC/IE/RP WD-PIU- PPP	Part of the regular monitoring	EPC Contractor	AE/PMC/R PWD-PIU- PPP

Env. Indicators	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervisi on/Monito ring
	Operation stage			Throughout the stretch	occurrence of accidents	Same as above	Same as above	Road Safety un PIU-PPP, with local police, AE	support from

Monitoring Costs: INR 46611000.00 excluding other applicable charges including GST to be mentioned in Terms and Conditions of Contract Agreement signed between EPC Contractor and Outsourced Monitoring Laboratory.

EFP: Environmental Focal Person, RPWD: Rajasthan State Public Works Department, NPK: Nitrogen, Phosphorous and Potassium, PMC: Project Management Consultant, AE: Authority Engineer, IEE: Initial Environmental Examination, IRC: Indian Road Congress, DEIAA: District Environmental Impact Assessment Authority, SEIAA: State Environmental Impact Assessment Authority, CPCB: Central Pollution Control Board, IS: Indian Standard

## **ENVIRONMENTAL MANAGEMENT PLAN FOR KHERLI-NADBAI-KUMHER ROAD**

				Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	
	re-construction Stage				•	ı		, <u> </u>
1.1 Alignment/Pa 1.1 Alignment Design	<ul> <li>Proposed design adopted in accordance with the provisions of the following IRC and BIS Codes/ MoRTH guidelines/ AASHTO specifications.</li> <li>Geometrical design standards will mostly follow.</li> <li>2-Lane Plus Carriageway:</li> <li>Carriageway Width = 7.0m,</li> <li>Paved Shoulder Width = 2 x 1.5m,</li> <li>Earthen/ Granular/ Paver block Shoulder Width= 2 x 2.0m or varying width shoulder.</li> <li>Side Drain = 2 x 1.5m footpath drain</li> <li>Roadway Width = 14.0m (Minimum)</li> <li>Road Way Length=38+60Km</li> <li>Paver Block Shoulder Width = 2 x 2.0m or varyin</li> <li>Side Drain = 2 x 1.5m footpath drain</li> <li>Side Drain = 2 x 1.5m footpath drain</li> </ul>		Widening of whole project road from km 72/000 to 110. + 600 (Length 38+ 600 km) shall follow the existing alignment unless geometric deficiencies with horizontal and vertical profiles which shall be corrected within available RoW as per prescribed standards.  Raising and reconstruction of embankment at location where road top level is equal to less than HFL.	MI: Recording of near miss, incident, accident, safety parameters etc w.r.t to designed alignment.  PT: Design in compliance to prescribed Standards.  MI: Design Parameter's compliance to prescribed Standards.  PT: Designs are in accordance with site requirements	Review of detail design documents & drawings and comparison with site conditions	Covered under preliminary design preparation by F/S consultant  Detailed design cost to be borne by EPC Contractor	Design Consultant	PMC/RPV D-PIU- PPP
1.2. Pavement Design	Bottom of crust shall be at least 600mm above HFL to prevent any capillary action due to black cotton/expansive/ cohesive soil.	Section 5 of the Manual of Specifications and Standards	Flexible pavement is proposed for a minimum design period	MI: Monitoring of wearing and damaging of	Review of detail design documents & drawings and comparison	Covered under preliminary design preparation	Design Consultant	PMC/RP\ D-PIU- PPP

				Monitoring indicators			on	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati	Supervisio n/Monitorin g
	<ul> <li>Flexible Pavement Thickness is proposed for almost entire length with minimum design period of 20 years.</li> <li>CBR value of sub grade as per IRC guidelines.</li> <li>40mm BC with PMB-70 has been considered as surface course and 60mm DBM with VG-30 has been considered for Base/ binder course.</li> <li>Also, Rigid Pavement thickness for small section for a design period of 30 years with PQC-M40 Grade of 300m, Dry Lean Concrete of 150mm and Granular Sub Base of 250mm.</li> </ul>	and IRC:37 & IRC:58.	of 20 years for the carriageway and paved shoulders of entire project stretch, except Toll Plaza Sections where Rigid Pavement shall be provided for a design period of 30 years.	pavement condition.  PT: Design Parameter's compliance to prescribed Standards.	with site conditions	by F/S consultant  Detailed design cost to be borne by EPC Contractor		
1.3. Drainage Provisions	<ul> <li>Raised embankment and provision of roadside drainage to prevent damage to pavement due to water logging on the road and also inconvenience caused to nearby community.</li> <li>Provision of adequate nos. of cross drainage structures.</li> <li>Increased (vent and height) in waterway of existing structures.</li> <li>Roadside drains have been proposed with suitable outfalls.</li> <li>Additional culverts and bridges</li> </ul>	Provision of lined drain as per IRC: SP:42-2014 & IRC: SP:50-2013.  IRC SP: 42-2014 and IRC SP: 50-2013.  MORTH Specifications for Road and Bridge Works 5th Revision 2013	Cross-Drainages  Culverts Reconstruction (3 nos. slab culverts, 2 stone slab culverts, 7 Utility Pipe Culverts, 4 pipe Culverts and 1 Box Culvert. The Contractor shall prepare drainage plan for complete highway and provide additional new	MI: Monitoring of the function of cross drainage, longitudinal drainages and climate adaptation during exigencies.  PT: Standard Design and required numbers of cross and side drains, slab/ box	Review of detail design documents & drawings and comparison with site conditions	Covered under preliminary design preparation by F/S consultant  Detailed design cost to be borne by EPC Contractor	Design Consultant	PMC/RPW D-PIU- PPP

				Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	
	<ul> <li>Causeway and submerged bridges to be replaced with high level bridges</li> <li>Roadside longitudinal drains to avoid water logging in built-up-sections and rural sections proposed with suitable outfalls.</li> <li>Prevention of waterlogging and overtopping due to intensive rainfall.</li> </ul>		culverts as per drainage design requirements at locations finalised in consultation with Authority Engineer (AE) and shall not be considered as Change of Scope.  Bridges Reconstruction of 1 minor bridge at km 05+431  Longitudinal drains (B/S together)  Footpath cum covered drains in built-up sections = 41.66 km (B/S). RWH at every 2km in a staggered manner on LHS and EHS in the entire project length	culverts, and Hume pipes				9

				Monitoring indicators			Institut	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs		Supervisio n/Monitorin g
1.4. Safety along the proposed alignment	<ul> <li>Vertical and horizontal geometrics in consistent to adequate numbers of road signs and pavement markings IRC/MORTH guidelines.</li> <li>Provision of crash barriers at high embankments.</li> <li>Speed breakers in habitat areas, schools, junction and curves to regulate speed.</li> <li>Provision retro-reflective warning signboards, LED traffic beacons near school, hospital, religious places and forests</li> <li>Safety kerb at all bridges</li> </ul>	Design requirement IRC:SP:73- 2007 IRC:SP:84- 2014 IRC:8, IRC:25, IRC:26, IRC:35, IRC:67, IRC:103 and Section 800 of MoRTH Specifications	Note: Utility Pipes are retained to be treated with minor/major repairs such as vegetation clearance, plastering of reinforcement exposed surface, silt removal & bed clearance and replacement of parapet which are damaged etc. in accordance with Section 7 of the Manual Curve locations  Speed Breakers and signages near built-up areas and toll plaza  Road Studs, object Markers etc.	MI: number and location of crash barriers, speed breakers, warning sign boards, road studs, object markers etc  PT: numbers and location are in accordance with site needs	Review of design documents and drawings and comparison with site conditions	Covered under preliminary design preparation by F/S consultant  Detailed design cost to be borne by concessionai re	Design Consultant	PMC/RPW D -PIU

				Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs		Supervisio n/Monitorin g
2. Natural Hazaro	<ul> <li>Informatory traffic signage/ Road markings on approach to built-up sections on Ambulance and medical aid posts</li> <li>Checking for overloading at toll plazas.</li> <li>Speed restrictions in built up sections curve locations etc.</li> <li>Roadside Safety Barriers near culverts, bridges.</li> <li>Pedestrian Guard Rails / Footpath Facilities at Schools.</li> <li>Other road safety furniture comprising road signs, road markings, object markers, hazard marker, studs, delineators, attenuators, safety barriers, pedestrian guard rails, boundary stones, kilometer stone etc.</li> </ul>	Horizontal geometry will be based on IRC: 38-1988 and vertical geometry will be based on IRC: SP 23-1993 ". IRC: SP: 67-2012						
2.1. Damage to pavement integrity like Rutting, embrittlement , softening and migration of liquid asphalt. and paved surfaces	Asphalt binder specifications based on viscosity-grade specifications as per IS 73-2013 guidelines and IS 15462 2004 for rubber modified binder and polymer modified binders.	IRC 37 2012 for flexible pavement design, IRC 81 1997 for strengthening of flexible pavement	Entire stretch	MI: Pavement Surface  PT: No softening, rutting, asphalt migration/the rmal expansion of joint	Review of design documents and drawings and comparison with site conditions	preliminary design cost of F/S consultant  Detailed design cost to be borne by concessionai re		PMC/RPW D-PIU

Fusinguage		Deference to		Monitoring indicators	Ba - it - viv -	Baltimeticus	Institut Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs		Supervisio n/Monitorin g
2.2. Flooding/Wat er-Logging	<ul> <li>Adequate number of CD structures. Additional culverts also proposed.</li> <li>CD structures designed for 50year return period.</li> <li>Water ways of bridges and culverts have been increased.</li> <li>Roadside drains also provided</li> <li>Embankment height raised along low lying/ potential water-logged areas.</li> <li>Improvement in existing culverts</li> <li>2 Box culverts, 5 Slab culverts, 7 Pipe culverts, 25 Syphons and 2 Cross drains are proposed to prevent water logging and flooding.</li> </ul>	IRC:34 Recommendat ions for road construction in waterlogged area and IRC: 75 and MORT&H guidelines for Design of High Embankments	Same as 1.1	MI: Design and numbers of cross & side drains, slab/box culverts Hume pipes, road embankment height, design and number of bridges  PT: Design and numbers are in accordance with site needs	Review of design documents and drawings and comparison with site conditions	Covered under costs for DPR consultants and PPTA consultants	Design Consultant	PMC/RPW D-PIU
2.3. Earthquake	Relevant IS codes shall be adopted in designing the structures to sustain the magnitude of earthquake corresponding to Seismic zone of the project area	Dislodgement of superstructure shall be taken as per Clause 222 of IRC:6.	Entire Stretch	MI: Culverts  PT: Design conforms BIS and IRC guidelines	Review of design documents and drawings and comparison with site conditions	F/S consultant, Detailed design cost to be borne by concessional re	Design Consultant	PMC/RPW D-PIU
2.4. Drought	Ensure water availability for compaction work and consolidation of sub-structure	IRC:78-2000 Standard Specifications and Code of Practice for Road Bridges	Entire Stretch	MI: Monitoring GW levels, public consultations with local communities	Design and drawings of foundations, substructure and superstructure of structures	Covered under F/S consultant cost	Design Consultant	PMC/RPW D-PIU

				Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	
				PT: Water availability and scarcity				
2.5. Forest Fires	<ul> <li>Measures to avoid accident followed by fuel spills.</li> <li>Removal of maintenance slash or management by controlled burning.</li> <li>Plant fire-resistant species in RoW</li> <li>Thinning slashing during nondry season.</li> <li>No construction camp within 500m of Notified Forest Areas.</li> </ul>	Design requirement	There is no forest along proposed road	MI: Damage to roadside flora and spillage /fuel accumulation induced accident  PT: Zero incidence of forest ire		Covered under F/S consultant cost	Design Consultant	PMC/RPW D-PIU
3. Loss of Land		T	T	T	1	1	1	1
3.1. livelihood loss to affected persons	<ul> <li>Road improvement work to be accommodated within available ROW to the extent possible.</li> <li>Minimize resettlement impact due to heavily congested built-up section</li> <li>Social Impact Assessment and Resettlement Plan to be undertaken as per national policy and ADB' guidelines.</li> <li>Complete all necessary land and property acquisition procedures prior to the commencement of civil work.</li> <li>Adhere to the Land Acquisition procedures in accordance to RP's Entitlement Framework.</li> </ul>	The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation And Resettlement Act, 2013 and ADB's involuntary resettlement policy.  Contract Clause for preference to local people during employment.	Refer SIA/RAP for more details	MI: Payment of compensation and assistance to DPs as per RP  Number of complaints/grievances related to compensation and resettlement PT: Minimal number of complaints/grievances. All cases of resettlement and	Check LA records; design drawings vs land plans; Interview with affected persons Check status of employment given to local people during construction	Part of administrative and resettlement costs	RPWD and implementing NGO	PMC/RPW D-PIU

				Monitoring indicators			Instituti Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs		Supervisio n/Monitorin g
4. Diversion of F	<ul> <li>Compensation and assistance as per project Resettlement Plan</li> <li>Income restoration as per RP</li> <li>Preference in employment and petty contracts during construction to APs</li> <li>Constitute GRC as per RP</li> <li>orest Land and Cutting of Trees</li> </ul>			rehabilitation if any are resolved at GRC level. No case referred to arbitrator/cou rt				
4.1. Need for cutting of trees and diversion of forest land	<ul> <li>Geometric adjustments to minimize tree cutting and diversion of forest land</li> <li>Obtain tree cutting permission from forest department</li> <li>Provision for mandatory compensatory afforestation (1:3) for deposit of payment to Forestry Department</li> <li>Provision for additional compensatory plantation on 1: 3 basis to be implemented by concessionaire</li> </ul>	Forest Conservation Act, 1980	Forest Diversion =Nil Total number of affected trees= 1192  EPC Contractor shall plant 4000 saplings as per Schedule-C.	MI: Number and location of geometric adjustments made to avoid forestland and tree cutting, budget amount allocated for compensator y afforestation and additional plantation (1:3)  PT: Unnecessary tree felling on forest land avoided. Budget allocation is adequate,	Review final design. Check budget provision for compensator y afforestation and additional plantation. Onsite validations of plantations carried out. Checklists based monitoring	design preparation	RPWD, Design consultants forest department	SHAH/For est departmen t, IE/PMC/R PWD-PIU
5. Shifting of Util	lities							

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Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	
5.1. Disruption of utility services to local community	cables should be shifted	Project requirement	Throughout the corridor	MI: Number of complaints from local people, number, timing and type of notifications issued to local people, time taken to shift utilities PT: No. of complaints should be 0. Minimal time for utility shifting	Interaction with concerned utility authorities and local public Checklists based monitoring	Included under RPWD's costs	EPC Contractor/ RPWD/utility company	AE/PMC/R PWD-PIU
B. Construction							I	I.
1. Preparatory a					T		T	_
1.1 Preparatory activities	Submit appointment letter and resume of the EPC Contractor's Environmental Focal Person (EFP) to PMU     EFP will engage PMC Environment Specialist and PMU Safeguard Officer-Environment to a meeting to discuss in detail the EMP, seek clarification and recommend corresponding revisions if necessary     EFP will prepare implementation schedule of the approved EMP, EMoP, and agreements reached	Project requirement	Project Office, EPC Contractor's construction camp	Approvals, attendance Checklists based monitoring	PMC accomplishm ent report	Part construction cost for Contractor and PMC Contract	EPC Contractor/ RPWD/utility company	AE/PMC/R PWD-PIU

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Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Respons Implementati on	
	during the meeting with PMC-ES and PMU-SOE  • EFP will consult Environmental Safeguard Implementation Manual and will apply monthly monitoring formats (Checklists) and establish deadlines for submission in consultations with ES(PMC) and ES (AE).  • EFP will submit for PMC-ES approval an action plan to secure all permits and approvals needed to be secured during construction stage which include but not limited to: i) operation of crushers and hot mix plants, ii) transport and storage of hazardous materials (e.g. fuel, lubricants, explosives), iii) waste disposal sites, iv) temporary storage location, iv) water use, and v) emission compliance of all vehicles. Arrangements to link with government health programs on hygiene, sanitation, and prevention of communicable diseases will also be included in the action plan.  • EFP will submit for approval of PMC-ES the construction camp layout before its establishment.							
1.2 Site induction	No works will be initiated by the EPC contractor until the	requirement	Conference/Me eting Room in construction	Approvals, attendance	PMC accomplishm ent report	Part construction cost for	EPC Contractor/	

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Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs		
	site induction training is carried out by the PMC  Site induction training includes but not limited to: i) discussion and review of EMP and EMOP detailing how specific environmental risks associated with their Scope of Work will be managed legal compliance, inspection and audits, and progress tracking and reporting; ii) environmental training and awareness needs shall be determined and documented via a training needs analysis prior to commencement; iii) Health and Safety Awareness Course, which details general environmental awareness and specific performance requirements expected on site; and iv) GRM and v) compliances to implementation of Community Occupational Safety & Health Plan (COSHP) for prevention and control of spread of COVID-19		camp of EPC Contractor or any other suitable place, adequately big enough in aeral size for observed required social distancing, where Audio- visual facilities for delivering training programmes, can be installed.	Checklists based monitoring		Contractor and PMC Contract	RPWD/utility company	
1.3 Poor siting and layout of workers camp and other infrastructure facilities	<ul> <li>The location, layout and basic facility provision of each labour camp and others will be submitted to (Supervision Consultant) and Project Implementing Unit (PIU) prior to their construction.</li> <li>Ensure solid waste and liquid management plan subject to</li> </ul>	Project requirement. General Condition of the Bid Document	All contractors and sub- contractors	MI: Review the design Check compliance with design sitting. PT: Confirms Camps site not disturbs	Observations on the site location	Part construction cost for Contractor and PMC Contract	EPC Contractor	AE/PMC/R PWD-PPP- PIU

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Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	
	the review and approval of the Supervision Consultant Camps sitting to maintain minimum distance from following: # 500m from habitations # 500m from water bodies # 500m from main traffic routes Land agreement with land owner for establishment of construction/ labour camps Submit CTE/ CTO from PCB for establishment of camps, crushers, HMP, WMM, batching plants etc.			the nearby habitation and main road traffic. Not to pollute receiving waterbodies.  Checklists based monitoring				
2. Air Quality	batering plante etc.							
2.1 Dust Generation due to construction activities and transport, storage and handling of construction materials	<ul> <li>Concessionaire to submit location and layout plan for storage areas of construction materials agreed by PD-PPP-PIU-RPWD and TL(AE).</li> <li>Transport, loading and unloading of loose and fine materials through covered vehicles.</li> <li>Paved approach roads.</li> <li>Storage areas to be located downwind of the habitation area.</li> <li>Water spraying on earthworks, unpaved haulage roads and other dust prone areas.</li> <li>Provision of PPEs to workers.</li> </ul>	MORT&H Specifications for Road and Bridge works Air (P and CP) Act 1974- Sunsequent Amendments and Central Motor and Vehicle Act 1988 General Conditions of Bid Document,	Throughout project corridor as required during construction activities,  Human Habitation during commencemen t of construction activities in Akhegarh, Bhikru, Barolichchar, Katara, Nadbai, Gangroulli, Asrawan, Pidi,	MI: NAAQS Limits, Complaints from locals due to dust  PT: Compliances to NAAAQS Number of complaints should be zero.	Standards CPCB methods Observations Public consultation Review of monitoring data maintained by EPC contractor Checklists based Monitoring	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU

				Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs		Supervisio n/Monitorin g
			Kumher. Chainages of these built up areas and schools are as per 15 (Schedule-A) and Section 7.22 of ScheduleB.					
2.2 Emission of air pollutants (HC, SO2, NOX, CO etc) from vehicles due to traffic congestion and use of equipment and machinery	<ul> <li>Regular maintenance of machinery and equipment.</li> <li>Batching, asphalt mixing plants and crushers at downwind (1km) direction from the nearest settlement.</li> <li>Only crushers licensed by the PCB shall be used.</li> <li>DG sets with stacks of adequate height and use of low Sulphur diesel as fuel.</li> <li>LPG should be used as fuel source in construction camps instead of wood</li> <li>Ambient air quality monitoring.</li> <li>Contractor to prepare traffic management and dust suppression plan duly approved by PD-PIU-PP-RPWD after review by TL (AE).</li> <li>Periodic pollution checking of all vehicles and obtaining of Pollution Under Control</li> </ul>	The Air (Prevention and Control of Pollution) Act, 1981 and applicable subsequent Amendments.  Requirements of Report of Environmental Pollution (Prevention and Control) Authority for the National Capital Region, dated 24th April 2017, submitted to all SPCBs.	plants, crushers, DG sets locations  Human Habitation during commencemen t of construction activities in Akhegarh, Bhikru,	MI: Levels of HC, SO2, NO2, and CO. Status of PUC certificates  PT: Compliances to NAAQS. PUC certificates of equipment and machinerys is upto date	Standards CPCB methods  Review of monitoring data maintained by EPC contractor  Checklists based Monitoring	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU

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Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	
O. Nation	Certificates (PUCs) and their renewal at required periods of time.		7.22 of Schedule-B.					
3. Noise 3.1 Disturbance	All equipment to be timely	Legal	Throughout	MI: day and	As per Noise	Included in	EPC	AE/PMC/R
to local residents and sensitive receptors due to excessive noise from construction activities and operation of equipment and machinery	<ul> <li>All equipment to be timely serviced and properly maintained.</li> <li>Construction         equipment and machinery to be fitted with silencers and maintained properly.</li> <li>Only IS approved equipment shall be used for construction activities.</li> <li>Timing of noisy construction activities shall be done during night time and weekend near schools,</li> <li>Implement noisy operations intermittently to reduce the total noise generated</li> <li>Manage existing traffic to avoid traffic jams and accumulation of noise beyond standards.</li> <li>Restrict construction near residential, built up and forest areas construction to day light hours.</li> <li>Honking restrictions near sensitive areas.</li> <li>PPEs to workers</li> <li>Noise monitoring as per EMoP.</li> </ul>	requirement Noise Pollution (Regulation and Control) Rules, 2000 and amendments thereof + Clause No 501.8.6. MORT&H Specifications for Road and Bridge works	project section especially at construction sites and residential and sensitive locations.  Human	night Noise levels. Number of complaints from local people  PT: Zero complaints or no repeated complaints by local people. Average day and night time noise levels are within permissible limits for work zone areas	Consultation with local people Review of noise level monitoring data maintained by contractor Observation of construction site Checklists based monitoring	civil works costs	Contractor	PWD-PIU
4. Land and Soil								

				Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs		Supervisio n/Monitorin g
4.1 Land use Change and Loss of productive / topsoil	<ul> <li>Non-agricultural areas to be used as borrow areas to the extent possible.</li> <li>If using agricultural land, top soil to be preserved and laid over either on the embankment slope for growing vegetation to protect soil erosion.</li> <li>Land for temporary facilities like construction camp, storage areas etc. shall be brought back to its original land use</li> </ul>	Project requirement, Applicable ADB and IRC Guidelines	Throughout the project section and borrow areas  Land identified for camp, storage areas etc.	MI: Borrow pit locations/Top soil storage area, Compliances with Applicable ADB and IRC Guidelines PT: Zero complaints or disputes registered against contractor by land owner	Review borrow area plan, site visits  Checklists based monitoring	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU
4.2 Slope failure and Soil erosion due to Construction activities, earthwork, and cut and fill, stockpiles etc.	<ul> <li>Bio-turfing of embankments to protect slopes.</li> <li>Slope protection by providing</li> <li>frames, dry stone pitching, masonry retaining walls, planting of grass and trees.</li> <li>Side slopes of all cut and fill areas will be graded and covered with stone pitching, grass and shrub as per design specifications. Care should be taken that the slope gradient shall not be greater than2:1.</li> <li>The earth stockpiles to be provided with gentle slopes to soil erosion.</li> </ul>	IRC: 56 -1974 recommended practice for treatment of embankment slopes for erosion control Clause No. 306 and 305.2.2 MORT&H Specifications for Road and Bridge works Guidelines IX for Soil erosion	Throughout the entire project road	MI: Occurrence of slope failure or erosion issues PT: No slope failures. Minimal erosion issues Checklists based monitoring	Review of design documents and site observation	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU
4.3 Borrow area management	Non-productive, barren lands, upland shall be used for borrowing earth with the	IRC Guidelines on borrow areas and for	Borrow sites /locations	MI: Existence of borrow areas in inappropriate	Review of design documents	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU

				Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	
	necessary permissions/consents.  Depths of borrow pits to be regulated and sides not steeper than 25%.  Topsoil to be stockpiled and protected for use at the rehabilitation stage.  Transportation of earth materials through covered vehicles.  Follow IRC recommended practice for borrow pits (IRC 10: 1961) for identification of location, its operation and rehabilitation  Borrow areas not to be dug continuously.  To the extent borrow areas shall be sited away from habitated areas.  Borrow areas shall be leveled with salvaged material or other filling materials which do not pose contamination of soil. Else, it shall be converted into fish pond.	quarries (Environmenta I protection Act and Rules, 1986; Water Act, Air Act)+Clause 305.2.2 MORTH Specifications for Road and Bridgeworks, Applicable ADB and IRC Guidelines for Borrow Areas management		unauthorized locations. Poor borrow area management practices. Number of accidents. Complaints from local people.  PT: No case of noncompliance with Applicable ADB and IRC Guidelines. Zero accidents. Zero complaints No use of black cotton soil	and site observations  Checklists based monitoring			
4.4 Quarry Operations	<ul> <li>Aggregates will be sourced from existing licensed quarries.</li> <li>Copies of consent/ approval / rehabilitation plan for a new quarry or use of existing source will be submitted to RPWD.</li> </ul>	Clause No.111.3 MORT&H Specifications for Road and Bridge works Guidelines VI for Quarry	New Quarry if needed	MI: Existence of licenses quarry areas from which materials to be sourced and Existence of a quarry	Review of design documents, contractor documents and site observation Compliance to EC	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU

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Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati	
	The contractor will develop a Quarry Redevelopment plan, as per the Mining Rules of the state and submit a copy of the approval to EA.  Obtain environmental clearance from SEIAA //DEIAA in case of opening new quarry	Areas Management Environmental Protection Rules		redevelopme nt plan  PT: Quarry license is valid.: No case of noncompliance to consent conditions and air quality meets the prescribed limit	conditions in case of opening new quarries  Checklists based monitoring			
4.5 Compaction of soil and impact on quarry haul roads due to movement of vehicles and equipment	<ul> <li>Construction vehicles, machinery, and equipment to be stationed in the designated ROW to avoid compaction.</li> <li>Approach roads/haulage roads shall be designed along the barren and hard soil area to reduce the compaction.</li> <li>Transportation of quarry material to the dumping site through heavy vehicles shall be done through existing major roads to the extent possible to restrict wear and tear to the village/minor roads.</li> <li>Land taken for construction camp and other temporary facility shall be restored to its original conditions.</li> </ul>	Design requirement		MI: Location of approach and haulage roads Presence of destroyed/compacted agricultural land or land which has not be restored to its original condition PT: Zero occurrence of destroyed/compacted land undestroyed land	observation	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU
4.6 Contaminatio n of soil due to leakage/ spillage of oil,	Construction vehicles     and equipment will be     maintained and refueled in     such a fashion that oil/diesel	Design requirement	Fueling station, construction sites, and construction	MI: Quality of soil near storage area	Site observation	Included in civil work cost.	EPC Contractor	AE/PMC/R PWD-PIU

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Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs		
bituminous and non- bituminous debris generated from demolition and road construction	spillage does not contaminate the soil.  Fuel storage and refueling sites to be kept away from drainage channels.  Unusable debris shall be dumped in ditches and low lying areas.  To avoid soil contamination Oil-Interceptors shall be provided at wash down and refueling areas.  Waste oil and oil soaked cotton/ cloth shall be stored in containers labeled 'Waste Oil' and 'Hazardous' sold off to MoEF/SPCB authorized vendors  Non-bituminous wastes to be dumped in borrow pits with the concurrence of landowner and covered with a layer of topsoil conserved from opening the pit.  Bituminous wastes will be disposed off in an identified dumping site approved by the State Pollution Control Board		camps and disposal location.	Presence of spilled oil or bitumen in project area  PT: Soil test conforming to no — contaminatio n. No sighting of spilled oil or bitumen in construction site or camp site	Checklists based monitoring			
5. Water Resource		T = =	T	T		T	T	T
5.1 Sourcing of water during Construction	<ul> <li>Requisite permission shall be obtained for abstraction of groundwater from Central Groundwater Authority.</li> <li>Arrangements shall be made by EPC contractor that the water availability and</li> </ul>	CGWA Guidelines	Throughout the Project section  Water harvesting structure at toll plazas	MI: Approval from competent authority Complaints from local people on	Checking of documentation  Talk to local people	Included in civil work cost	EPC Contractor	AE/PMC/R PWD-PIU

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Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	
	supply to nearby communities remain unaffected.  Water intensive activities not to be undertaken during summer season.  Provision of water harvesting structure to augment recharging of groundwater conditions (aquifers) in the project area.  Permissions from Local Irrigation Department, in case using canal water.  Agreement letters with local level water suppliers.			water availability  PT: Valid approval from competent authority. Zero complaints from local people.	Checklists based monitoring			
5.2 Disposal of water during construction	Provisions shall be made to connect road side drains with existing nearby natural drains.	Clause No.1010 EP Act 1986 MORT&H Specifications for Road and Bridgeworks	Throughout the Project section. There is no major water body along the alignm	MI: Condition of drainage system in construction site. Presence /absence of water logging in project area.  PT: Existence of proper drainage system. No water logging in project area	Standards methods Site observation and review of Documents Checklists based monitoring	Included in civil work cost	EPC Contractor	AE/PMC/R PWD-PIU
5.3 Alteration in surface water hydrology	Existing drainage system to be maintained and further enhanced.	Design requirement, Clause No 501.8.6.	Near all drainage channels, river/	MI: Proper flow of water in existing	Review of design documents	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU

				Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs		Supervisio n/Monitorin g
	<ul> <li>Provision shall be made for adequate size and number of cross drainage structures esp. in the areas where land is sloping towards road alignment.</li> <li>Road level shall be raised above HFL level wherever road level is lesser than HFL.</li> <li>Culverts reconstruction shall not be done during lean flow period. In some cases these minor channels may be diverted for a very short period (15-30 days) and will be bring back to its original course immediately after construction.</li> </ul>	MORT&H Specifications for Road and Bridge	nallah crossings etc.	streams and rivers  PT: No complain of water shortage by downstream communities. No record of overtopping/ water logging	Site observation  Checklists based monitoring			
5.4 Siltation in water bodies due to construction activities /earthwork	<ul> <li>Embankment slopes to be modified suitably to restrict the soil debris entering water bodies.</li> <li>Provision of Silt fencing shall be made at water bodies.</li> <li>Silt/sediment should be collected and stockpiled for possible reuse as surfacing of slopes where they have to be re-vegetated.</li> <li>Earthworks and stone works to be prevented from impeding natural flow of rivers, streams and water canals or existing drainage system.</li> </ul>	Design requirement, ClauseNo501. 8.6. MORT&H Specifications for Road and Bridgeworks Worldwide best practices	Near all waterbodies /waterway	MI: Presence /absence of siltation in rivers, streams, ponds and other water bodies in project area. Turbidity test levels  PT: No records of siltation due to project activities. Surface water quality tests confirm	Field observation  Checklists based monitoring	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU

Environmental				Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs		Supervisio n/Monitorin g
	<ul> <li>Retaining walls at water bodies /ponds to avoid siltation near ponds</li> </ul>			to turbidity and TSS limit				
5.5 Deterioration in Surface water quality due to leakage from vehicles and equipment and waste from construction camps.	<ul> <li>No vehicles or equipment should be parked or refueled near water-bodies, so as to avoid contamination from fuel and lubricants.</li> <li>Oil and grease traps and fueling platforms to be provided at re-fueling locations.</li> <li>All chemicals and oil shall be stored away from water and concreted platform with catchment pit for spills collection.</li> <li>All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up. Readily available, simple to understand and preferably written in the local language emergency response procedure, including reporting, will be provided by the contractors.</li> <li>Construction camp to be sited away from water bodies.</li> <li>Wastes must be collected, stored and taken to approve disposal site only.</li> <li>Water quality shall be monitored</li> </ul>	The Water (Prevention and Control of Pollution) Act, 1974 and amendments thereof / as well as IS-10500:2012	Water bodies, refueling stations, construction camps.	MI: Water quality of ponds, streams, rivers and other water bodies in project  Presence of oil floating in water bodies in project area  PT: Surface water quality meets freshwater quality standards prescribed by CPCB	Conduction of water quality tests as per the monitoring plan  Field observation Checklists based monitoring	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU

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Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs		Supervisio n/Monitorin g
6. Flora and Faur	าล							
6.1 Vegetation loss due to site preparation and construction activities  7. Construction 0	<ul> <li>Restrict tree cutting up to toe line considering safety to road users.</li> <li>Roadside trees to be removed with prior approval of competent authority.</li> <li>Mandatory compensatory plantation at 1:3 basis by Forestry Department</li> <li>Additional plantation on 1:3 basis as per the IRC guidelines to be carried out by concessionaire</li> <li>Regular maintenance trees planted.</li> <li>Provision of LPG in construction camp as fuel source to avoid tree cutting.</li> <li>Plantation of trees on both sides of the road where technically feasible. Trees should be offset 1m back from the ultimate edge of the roadway to prevent safety hazard and provide adequate sight distance.</li> <li>Integrate vegetation management (IVM) with the carriage way completely clear of vegetation.</li> <li>Controlled use of pesticides/ fertilizers</li> </ul>	Forest Conservation Act1980 + IRC:SP:21 and IRC:SP:66	Throughout project corridor  Estimated No. of affected tree=1168  EPC Contractor shall plant 4000 saplings as per Schedule-C. EPC Contractor shall look after operation and maintenance of this plantation.	MI: ROW width Number of trees for felling Compensator y plantation plan Number of trees replanted.  PT: compensator y afforestation done on a 1:3 basis by concessionai re.	Review of relevant documents – tree cutting permit, compensator y plantation plan. and additional plantation strategy  Field observations  Checklists based monitoring	Mandatory Compensato ry afforestation cost is included in project costs under RPWD. Additional compensator y afforestation costs included in civil works costs	Mandatory Compensator y plantation by forest Department and additional plantation by EPC Contractor	AE/PMC/R PWD-PIU
7.1 Impact	All camps should be	Design	Construction	MI: Location	On site	Included in	EPC	AE/PMC/R
associated with location	established with prior permission from PCB. Camps	Requirement	camp	of campsites and distance	observation	civil works cost	Contractor	PWD-PIU

				Monitoring indicators			Instituti Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	
	to maintain minimum distance from following:  # 500 m from habitation  # 500 m from forest areas where possible  # 500 m from water bodies where possible  # 500 m from through traffic route  # 500 m from identified wildlife crossing areas  # No construction camp within 500 m of water body	As identified in IEE, All applicable laws, rules and regulations including Contract Labour laws as well as, EHS policy and rules.		from habitation, forest areas, water bodies, through traffic route and construction camps PT: Distance of campsite is less than 500m from listed locations	Interaction with workers and local community  Checklists based monitoring			
7.2 Worker's Health in construction camp	<ul> <li>The location, layout and basic facility provision of each labor camp will be submitted to AE and approved by PD-PIU-PPP-RPWD. The EPC contractor will maintain necessary living accommodation and ancillary facilities in hygienic manner.</li> <li>Adequate water and sanitary latrines with septic tanks with soak pits shall be provided.</li> <li>Preventive medical facilities in camp</li> <li>Waste disposal facilities such as dust bins must be provided in the camps and regular disposal of waste The EPC Contractor will take all precautions to protect the workers from insect and pest to reduce the risk to health.</li> </ul>	The Building and Other Construction workers (Regulation of Employment and Conditions of service) Act 1996 and The Water (Prevention and Control of Pollution) Act, 1974 and amendments thereof	All construction camps	MI: Camp health records, Compliance to SOPs of COSHP for COVID-19 Protection.  Existence of proper first aid kit in camp site  Complaints from workers.  PT: No record of illness due to unhygienic conditions or	Camp records  Site observation  Consultation with contractor workers and local people living nearby	Part of the civil works costs	EPC Contractor	AE/PMC/R PWD-PIU

				Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs		Supervisio n/Monitorin g
8. Management of Sites	This includes the use of insecticides which should comply with local regulations.  No liquor or prohibited drugs will be imported to, sell, give and barter to the workers of host community.  Awareness raising to immigrant workers/local community on communicable and sexually transmitted diseases.  Compliance to SOPs of COSHP for COVID-19 Protection.  Construction Waste/Debris  Contractor to submit a waste/spoil disposal plan and get it approved by AE and PD-PIU-PPP-RPWD.  Create controlled dumping sites with a non-permeable lining incorporated in the pit design to avoid leachate seepage into the soil, which may later affect ground water quality  Unproductive/wastelands shall be selected for dumping sites away from residential areas and water bodies  Dumping sites must be having adequate capacity equal to the amount of debris generated.  Public perception and consent from the village Panchayats	Design Requirement, MORT&H guidelines and General Conditions of Contract Document, Construction and Demolition Waste Management Rules-2016 and subsequent Amendments.	At all Dumping/Dispo sal Sites	vectors. Zero cases of STD. Clean and tidy camp site conditions. Compliance to SOPs of COSHP for COVID-19 Protection. Checklists based monitoring  MI: Location of dumping sites Number of public complaints.  PT: No public complaints.  Consent letters for all dumping sites available with contractor	Field survey and interaction with local people. Review of consent letter Checklists based monitoring	Included in civil works cost.	EPC Contractor	AE/PMC/R PWD-PIU

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Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	
	has to be obtained before finalizing the location.							
8.2 Reuse and disposal of construction and dismantled waste	<ul> <li>The existing bitumen surface shall be utilized for paving of cross roads, access roads, and paving works in construction sites and camps, temporary traffic diversions, and haulage routes.</li> <li>All excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping.</li> <li>Unusable and non-bituminous debris materials should be suitably disposed off at predesignated disposal locations, with approval of the concerned authority.</li> <li>The bituminous wastes shall be disposed in secure landfill sites only in environmentally accepted manner. For removal of debris, wastes and its disposal, MORTH guidelines should be followed.</li> <li>Unusable and surplus materials, as determined by the Project Engineer, will be removed and disposed offsite.</li> </ul>	Design Requirement, MORT&H guidelines and General Conditions of Contract Document  Construction and Demolition Waste Management Rules 2016 and subsequent Amendments.	Throughout the project corridor	MI: Percentage of reuse of existing surface material  Method and location of disposal site of construction debris  PT: No public complaint and consent letters for all dumping sites available with contractor or CSC	Contractor records  Field observation  Interaction with local people  Checklists based monitoring	Included in civil works cost.		
9. Traffic Manage	ement and Safety							
9.1 Management of existing traffic and safety	be submitted by the contractor and approved by the CSC.	Design requirement and	Throughout the project corridor especially at intersections.	MI: Traffic management plan. Presence/	Review traffic management plan	Included in civil works cost.	EPC Contractor	AE/PMC/R PWD-PIU

				Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	
	The traffic control plans shall contain details of diversions; traffic safety arrangements during construction; safety measures for night time traffic and precautions for transportation of hazardous materials. Timing and scheduling to be done so that transportation of dangerous goods is done during least number of people and other vehicles on the road. The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.	1984, Report Containing Recommendat ion of IRC Regional Workshops on Highway Safety IRC:SP: 32 - 1988 Road Safety for Children (5-12 Years Old) in Construction Zones IRC:SP:55-2014		absence of safety signs, traffic demarcations , flag men etc. on site. Complaints from road users.	Field observation of traffic management and safety system Interaction with people in vehicles using the road Checklists based monitoring			
	<ul> <li>On stretches where it is not possible to pass the traffic on the part width of existing carriageway, temporary paved diversions will be constructed.</li> <li>Restriction of construction activity to only one side of the existing road</li> <li>The contractor shall inform local community of changes to traffic routes, and pedestrian access arrangements with assistance from "Engineer".</li> </ul>	and other Construction workers Act 1996 and Cess Act of 1996 Factories Act 1948+Section 6 of Employer's						

		Defense t		Monitoring indicators	B. B. a. a. 14	BAPA A	Instituti Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	
	Use of adequate signage's to ensure traffic management and safety. Conduct of regular safety audit on safety measures.							
9.2 Pedestrians, animal movement	<ul> <li>Temporary access and diversion, with proper drainage facilities.</li> <li>Access to the schools, temples and other public places must be maintained when construction takes place near them.</li> <li>Fencing wherever animal movement is expected.</li> <li>Large number of box culverts has been proposedAll structures having vertical clearance above 2m and not catering to perennial flow of water may serve as underpass for animals</li> </ul>	Same as above	Near habitation on both sides of schools, temples, construction sites, haulage roads, diversion sites.	MI: Presence/ absence of access routes for pedestrians. Road signage Number of complaints from local people  PT: Easy access to schools, temples and public places. Zero complaints	Field observation Interaction with local people Checklists based monitoring	Included in civil works cost.	EPC Contractor	AE/PMC/R PWD-PIU
9.3 Safety of Workers and accident risk from construction activities	<ul> <li>Contractors to adopt and maintain safe working practices.</li> <li>Usage of fluorescent and retro refectory signage, in local language at the construction sites</li> <li>Training to workers on safety procedures and precautions.</li> <li>Mandatory appointment of safety officer.</li> <li>All regulations regarding safe scaffolding, ladders,</li> </ul>	Same as above	Construction sites	MI: Availability of Safety gears to workers  Safety signage Training records on safety	Site observation  Review records on safety training and accidents  Interact with construction workers	Included in civil works cost	Obligation of EPC Contractor	AE/PMC/R PWD-PIU

Facilities		Defenses		Monitoring indicators	B4	B#141 a 41	Institut Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	
	working platforms, gangway, stair wells, excavations, trenches and safe means of entry and egress shall be complied with.  Provision of PPEs to workers.  Provision of a readily available first aid unit including an adequate supply of dressing materials.  The contractor will not employ any person below the age of 18years  Use of hazardous material should be minimized and/or restricted.  Emergency plan (to be approved by engineer) shall be prepared to respond to any accidents or emergencies.  Accident Prevention Officer must be appointed by the contractor.			Number of safety related accidents  PT: Zero fatal accidents. Zero or minor non-fatal accidents.  Checklists based monitoring				
9.4 Accident risk to local community	<ul> <li>Restrict access to construction sites only to authorized personnel.</li> <li>Physical separation must be provided for movement of vehicular and human traffic.</li> <li>Adequate signage must be provided for safe traffic movement</li> <li>Provision of temporary diversions and awareness to locals before opening new construction fronts.</li> </ul>	Same as above	Construction sites	MI: Safety signs and their location  Incidents of accidents  Complaints from local people PT: Zero incident of accidents. Zero complaints.	Site inspection  Consultation with local people  Checklists based monitoring	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU

Facility and a state of		Defenence to		Monitoring indicators	Manitonia a	B#141 41	Institut Respons	-
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitorin g
	n and rehabilitation							
10.1 Clean-up Operations, Restoration and Rehabilitation	<ul> <li>Contractor will prepare site restoration plans, which will be approved by the AE.</li> <li>The clean-up and restoration operations are to be implemented by the contractor prior to demobilization.</li> <li>All construction zones including river-beds, culverts, road-side areas, camps, hot mix plant sites, crushers, batching plant sites and any other area used/affected by the project will be left clean and tidy, to the satisfaction of the Environmental officer.</li> <li>All the opened borrow areas will be rehabilitated and 'AE' will certify</li> </ul>	Project requirement	Throughout the project corridor, construction camp sites and borrow areas	MI: Condition of camp, borrow areas and construction sites, Presence/ absence of construction material/debr is after completion of construction works on site. PT: Clean and tidy sites. No trash or debris left on site. Site restored and leveled.	Site observation Interaction with locals Issue completion certificate after restoration of all sites are found satisfactory Post-construction EMP implementation checklists-based monitoring	Included in civil works cost.	EPC Contractor	AE/PMC/R PWD-PIU
	l Maintenance stage							
1. Air Quality		1 -	I <b></b>	T		T	T	1
1.1 Air pollution due to due to vehicular movement	<ul> <li>Roadside tree plantations shall be maintained at least with 70% survival rate.</li> <li>Regular maintenance of the road will be done to ensure good surface condition</li> <li>Ambient air quality monitoring. If monitored parameters exceeds prescribed limit, suitable control measures must be taken.</li> </ul>	Environmental Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981, Motor Vehicles Act 1948 and subsequent Amendments	Throughout the Corridor. Human Habitation during commencemen t of construction activities in Akhegarh, Bhikru, Barolichchar, Katara, Nadbai,	air quality (PM10, CO, SO2 NO2) PT: Levels are equal to or below	As per CPCB requirements  Site inspection	Included in Operation / Maintenance cost	Implementati on by EPC Contractor and Supervision & monitoring by AE/PMC/RP WD-PIU	

				Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	
	<ul> <li>Signages shall be provided reminding them to properly maintain their vehicles to economize on fuel consumption.</li> <li>Enforcement of vehicle emission rules in coordination with transport department or installing emission checking equipment. Obtaining of Pollution Under Control Certificates ( PUCs) and their renewal on periodic basis.</li> </ul>	Requirements of Report of Environmental Pollution (Prevention and Control) Authority for the National Capital Region, dated 24th April 2017, submitted to all SPCBs.	Gangroulli, Asrawan, Pidi, Kumher  Sensitive Receptors along the alignment					
2. Noise				I	1			
2.1 Noise due to movement of traffic	<ul> <li>Effective traffic management and good riding conditions shall be maintained</li> <li>Speed limitation to 20 km/hour and honking restrictions near sensitive receptors</li> <li>Monitoring of Performance of Noise Barriers constructed and New Construction of any further required noise barriers near sensitive receptors with consent of local community</li> <li>Create awareness amongst the residents about likely noise levels from road operation at different distances, the safe ambient noise limits and easy to implement noise reduction</li> </ul>	Noise Pollution (Regulation and Control) Rules, 2000 and amendments thereof	Residential and sensitive locations location s of air quality monitoring. Human Habitation during commencemen t of construction activities in Akhegarh, Bhikru, Barolichchar, Katara, Nadbai, Gangroulli, Asrawan, Pidi, Kumher	MI: Noise levels  PT: Levels are equal to or below baseline levels given in the IEE report	Noise monitoring as per noise rules, 2000  Discussion with people at sensitive receptor sites	Included in Operation / Maintenance cost	Implementati on by EPC Contractor and Supervision & monitoring by AE/PMC/RP WD-PIU	

Environmental		Reference to		Monitoring indicators	Monitoring	Mitigation	Instituti Respons	ibility
Issue/Component	Remedial Measure	laws/guideline Location		(MI)/ Performance Target (PT)	Methods	Costs	Implementati on	Supervisio n/Monitorin g
	measures while constructing a building near road.							
3. Land and Soil 3.1 Soil erosion at embankment during heavy rainfall.	<ul> <li>Periodic checking to be carried to assess the effectiveness of the stabilization measures viz. turfing, stone pitching, river training structures etc.</li> <li>Necessary measures to be followed wherever there are failures</li> </ul>	Project requirement	At bridge locations and embankment slopes and other probable soil erosion areas.	MI: Existence of soil erosion sites Number of soil erosion sites PT: Zero or minimal occurrences of soil erosion	On site observation	Included in Operation / Maintenance cost	Implementati on by EPC Contractor and Supervision & monitoring by AE/PMC/RP WD-PIU	
4. Water resourc	es/Flooding and Inundation	•	<u> </u>	ı	•	•	•	
4.1 Siltation	<ul> <li>Regular checks shall be made for soil erosion conditions for its effective maintenance.</li> </ul>	Project requirement	Near surface Water bodies	MI: Water quality  PT: No turbidity of surface water bodies due to the road	Site observation	Included in Operation / Maintenance cost	Implementati on by EPC Contractor and Supervision & monitoring by AE/PMC/RP WD-PIU	
4.2 Water logging due to blockage of drains, culverts or streams	<ul> <li>Regular visual checks and cleaning (at least once before monsoon) of drains to ensure that flow of water is maintained through cross drains and other channels/streams.</li> <li>Monitoring of water borne diseases due to stagnant water bodies</li> </ul>	Project requirement IRC: SP:21- 2009	Near surface Water bodies/cross drains/side drains	MI: Presence/ absence of water logging along the road  PT: No record of overtopping/ Water logging	Site observation	Included in Operation / Maintenance cost	Implementati on by EPC Contractor and Supervision & monitoring by AE/PMC/RP WD-PIU	
5. Flora					•		•	•

				Monitoring indicators			Institut Respons	
Environmental Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitorin g
5.1 Vegetation	<ul> <li>Planted trees, shrubs, and grasses to be properly maintained.</li> <li>The tree survival audit to be conducted at least once in a year to assess the effectiveness</li> </ul>	Forest Conservation Act 1980	Project tree plantation sites	MI: Tree/plants survival rate PT: Minimum rate of 70% tree survival	Records and field observations. Information from Forestry Department	Included in Operation / Maintenance cost	Implementati on by EPC Contractor and Supervision & monitoring by AE/PMC/RP WD-PIU	
6. Maintenance of	of Right of Way and Safety	•	1	•	•			•
6.1 Accident Risk due to uncontrolled growth of vegetation	<ul> <li>Maintain shoulder completely clear of vegetation.</li> <li>Minimum offset as prescribed in IRC:SP:21-2009 to be maintained</li> <li>Regular maintenance/trimming of plantation along the road side</li> <li>No invasive plantation near the road.</li> </ul>	Project requirement IRC: SP:21- 2009	Throughout the Project route	MI: Presence and extent of vegetation growth on either side of road. Number of accidents. PT: No accidents due to vegetation growth	Visual inspection Check accident records	Included in Operation / Maintenance cost	Implementati on by EPC Contractor and Supervision & monitoring by AE/PMC/RP WD-PIU	
6.2 Accident risks associated with traffic movement.	<ul> <li>Traffic control measures, including speed limits, will be enforced strictly.</li> <li>Further encroachment of squatters within the ROW will be prevented.</li> <li>Monitor/ensure that all safety provisions included in design and construction phase are properly maintained</li> <li>Highway patrol unit(s) forround the clock patrolling. Phone booth for accidental reporting and ambulance services with minimum response time for rescue of</li> </ul>	IRC:SP:55- 2014/And IRC:SP:88- 2010	Throughout the Project route	MI: Number of accidents Conditions and existence of safety signs, rumble strips etc. on the road Presence/ab sence of sensitive receptor structures inside the stipulated planning line	Review accident records Site observations	Included in Operation / Maintenance cost	Implementati on by EPC Contractor and Supervision & monitoring by AE/PMC/RP WD-PIU	

Environmental		Deference to		Monitoring indicators	Monitoring	Mitigation	Institut Respons	
Issue/Component	Remedial Measure	Reference to laws/guideline	Location	(MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitorin g
	<ul> <li>any accident victims, if possible.</li> <li>Tow-way facility for the breakdown vehicles if possible.</li> <li>Road Safety Audit should be conducted on regular basis</li> </ul>			as per relevant local law  PT: Fatal and non fatal accident rate is reduced after improvement				
6.3 Transport of Dangerous Goods	<ul> <li>Existence of spill prevention and control and emergency responsive system</li> <li>Emergency plan for vehicles carrying hazardous material</li> </ul>		Throughout the project stretch	MI: Status of emergency system — whether operational or not  PT: Fully functional emergency system	Review of spill prevention and emergency response plan Spill accident records	Included in Operation / Maintenance cost	Implementati on by EPC Contractor and Supervision & monitoring by AE/PMC/RP WD-PIU	

EFP: Environmental Focal Person, RPWD: Rajasthan State Public Works Department, NPK: Nitrogen, Phosphorous and Potassium, PMC: Project Management Consultant, AE: Authority Engineer, IEE: Initial Environmental Examination, IRC: Indian Road Congress, DEIAA: District Environmental Impact Assessment Authority, SEIAA: State Environmental Impact Assessment Authority, CPCB: Central Pollution Control Board, IS: Indian Standard

## **ENVIRONMENTAL MONITORING PLAN FOR KHERLI-NADBAI-KUMHER ROAD**

Env. Indicators	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervision/ Monitoring
Air Quality	Constructio	PM 10 PM 2.5		Human Habitation	During Active	Air quality	60x9000=	EPC	AE/PMC/RPW
	n stage	SO2, NOX,	sampler to be	during	Construction	standard by	Rs.5400000.	Contractor	D-PIU
		CO	located 50 m	commencement of	Phase	CPCB	00	through	
			from the	construction				approved	
			selected	activities in				monitoring	
			locations in the					agency	
			downwind	Barolichchar, Katara,					
				Nadbai, Gangroulli,					
			method	Asrawan, Pidi,					
			specified by	9					
			CPCB	of these built up					
				areas and schools					
				are as per 15 (					
				Schedule-A) and					
				Section 7.22 of Sc					
				Batching and hot mix					
				plants sampling part					
				of SPCB annual					
				renewal of permits					
				Total No of Samples					
				2 times in each					
				human habitations					
				during construction					
				period -36 samples					
				One sample for HMP, One sample					
				for Batching/RMC					
				Concreate Mix Plan					
				and one sample for					
				WMM Plant in each					
				quarter during					
				construction period.					
				Total No of sample-					
				18 samples.					
				Total numbers of					
				samples 54 during					
				entire scheduled					
				construction period.					
				No of samples may					

Env. Indicators	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervision/ Monitoring
				increase for EOT period.					
	Operation stage			Toll Plaza-one same each quarter. Total 3 samples in a year. Human habitations, specially sensitive receptors. 3 samples in each quarter. Total no of 9 samples.	24 hr continuous, 3/year for 1 year of operation period (Total 3 times in a year Except Monsoon Season)	standard by CPCB	288000.00	EPC Contractor through approved monitoring agency	AE/PMC/RPW D-PIU
Water Quality	Construction stage	Ground water: (IS: 10500:2012) and Surface water criteria for freshwater classification	Grab sample collected from source and analyse as per Standard Methods for Examination of Water and Wastewater	Groundwater at Construction Camps	3/year till the end of construction activities (Total 3 times in a year baring monsoon), 1 bore well, 1 surface water sample in each quarter. Minimum 3 samples in each quarter. Total no 18 samples during entire scheduled construction period. No of samples may increase for EOT period.	Water quality standard by CPCB	30x 5000= Rs 150000.00	EPC Contractor through approved monitoring agency	AE/PMC/RPW D-PIU
	Operation stage			Groundwater at 2 locations and surface water at 2 locations	3/year for 1 year	Water quality standard by CPCB	32x5000= Rs.160000.0 0	EPC Contractor through approved monitoring agency	AE/PMC/RP WD-PIU

Env. Indicators	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervision/ Monitoring
Noise levels	Constructio n stage	Equivalent Noise levels on dB (A) scale for day and night	IS:4954-1968 as adopted by CPCB for Identified Study Area CPCB/IS:4954- 1968Using Noise level	Same as air quality Total numbers of samples 54 during entire scheduled construction period. No of samples may increase for EOT period.	During Active Construction Phase	National Ambient Noise Standard specified in Environmen t Protection Act, 1986	60X 1500= Rs.90000.00	EPC Contractor through approved monitoring agency	AE/PMC/RPW D-PIU
	Operation stage		meter	Same as air quality	3/year for 1 year		32x1500= Rs.4800.00	EPC Contractor through approved monitoring agency	AE/PMC/RP WD-PIU
Soil Quality	Constructio n Stage	NPK (ICAR standard ) and heavy metals	As specified by the site engineer RPWD / supervision consultant	Camp, Dumping/storage areas and HMP sites (Total 3 sample locations)	Once during whole construction stage	ICAR standards	9x3000= Rs.27000.00	EPC Contractor through approved monitoring agency	AE/PMC/RPW D-PIU
	Operation stage	Oil and grease		At oil spillage locations and other probable soil contamination locations ( Total 3 samples)	Once for the first year of operation	ICAR Standards	9x3000= Rs.27000.00	EPC Contractor through approved monitoring agency	AE/PMC/RPW D-PIU
Soil Erosion	Constructio n Stage	Visual check for Soil erosion and		Throughout the Project Corridor especially at River	After first rain	Visual Checks	Included in Engineering Cost		AE/PMC/RPW D-PIU
	Operation Stage	siltation		banks, bridge locations and river training structures	Once during operation of 1st year	Visual Checks	Routine Engineering Work	Engineering Tea AE/PMC/RPWD	
Drainage Congestion	Constructio n stage	Visual Checks		Throughout the Project Corridor especially Probable	Once in a year before rainy season	None Specific	Included in Engineering Cost	EPC Contractor	AE/PMC/RPW D-PIU
	Operation Stage			drainage congestion areas	Once in a year before rainy season	None Specific	Routine Engineering Work	Engineering Te AE/PMC/RPWD	eam of RPWD/
Borrow	Constructio n Stage	Visual Checks	IRC guidelines	Borrow areas to be operated	Once in a month		EPC Contractor	EPC Contractor with	AE/PMC/RPW D-PIU

Env. Indicators	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervision/ Monitoring
Areas- Prior obtaining of						ADB and IRC		approval from AE/PIU-RPWD	
ECs for borrow areas is exempted by MoEFCC	Operation Stage	Visual Checks	Rehabilitation asper IRC guidelines	Closed Borrow Areas	Quarterly for 1 year	guidelines		EPC Contracto from AE/PIU-RP	
Constructio n Sites and Labor Camp	Constructio n stage	Hygiene, drainage Medical Facilities Etc.	Rapid audit as per reporting format	Construction Sites and Camp	Quarterly during construction period	IRC guidelines	Part of the regular monitoring	EPC Contractor with approval from AE/RPWD-PIU	AE/PMC/RP WD-PIU
Tree Plantation	Constructio n Stage	Surveillance m felling	onitoring of trees	Throughout the Project Section	During site clearance in construction phase	As suggested by Forest Dept.	Compensato ry: RPWD Additional Plantation: Provisional sum under	Compensatory: Forest Department Additional Implementation Contractor. Su Monitoring by A PIU	Plantation: by The EPC pervision and
	Operation stage	Audit for survi	ival rate of trees	Throughout the Project Section	Quarterly during Defect Liability Period		Civil Cost	Liability Period i stretch. After this PIU through Contractor will be monitoring	to the Defect n any particular s period RPWD- n PMC/EPC e responsible for
Record of Accident	Constructio n Stage		and cause of Methodology as by IE/Safety and approved by	Throughout the stretch including construction sites, crusher, diversions, HMP, earthwork, demolition site etc.	occurrence of accidents	As suggested by PMC/IE/RP WD-PIU	Part of the regular monitoring	EPC Contractor	AE/PMC/RPW D-PIU
Manifestoria	Operation stage	20000 000 001	allon other activities	Throughout the stretch	occurrence of accidents	Same as above	Same as above	Road Safety unit support from loand PMC	cal police, AE

Monitoring Costs: INR 6190000, 000 excluding other applicable charges including GST to be mentioned in Terms and Conditions of Contract Agreement signed between EPC Contractor and Outsourced Monitoring Laboratory.

EFP: Environmental Focal Person, RPWD: Rajasthan State Public Works Department, NPK: Nitrogen, Phosphorous and Potassium, PMC: Project Management Consultant, AE: Authority Engineer, IEE: Initial Environmental Examination, IRC: Indian Road Congress, DEIAA: District

Environmental Impact Assessment Authority, SEIAA: State Environmental Impact Assessment Authority, CPCB: Central Pollution Control Board, IS: Indian Standard.

## **ENVIRONMENT MANAGEMENT PLAN FOR PALODA-GARHI-ANANDPURI ROAD**

Environmental		Reference to		Monitoring indicators (MI)/	Monitoring	Mitigation	Institut Respons	
Issue/Component	Remedial Measure	laws/guidelin Location e		Performance Target (PT)	Methods	Costs	Implementati on	Supervisio n/Monitori ng
	-construction Stage							
1. Alignment/Pave		T	T	T	1	T	1	
1.1. Pavement damage and inadequate drainage provisions	<ul> <li>Proposed design adopted in accordance with the provisions of the following IRC and BIS Codes/ MoRTH guidelines/ AASHTO specifications.</li> <li>Geometrical design standards will mostly follow:</li> <li>2-Lane Plus Carriageway:</li> <li>Carriageway Width = 7.0m,</li> <li>Paved Shoulder Width = 2 x 1.5m,</li> <li>Earthen/ Granular/ Paver block Shoulder Width = 2 x 2.0m or varying width shoulder.</li> <li>Side Drain = 2 x 1.5m footpath drain</li> <li>Roadway Width = 14.0m (Minimum)</li> <li>Roadway Length = 54.100 km</li> </ul>	Section 2 of the Manual of Specifications and Standards for Two Lanning of Highways with Paved Shoulder (IRC: SP:73-2018)	Repair of Major Bridge = 1 at Anans River ( 55+800).  Reconstruction of 6 minor bridges at CHs at 34+410, 43+512, 61+150, 65+795, 66+780 and 71+325. All existing chainages.  Reconstruction of 9 slab culverts, 5 box culverts, 75 pipe culverts.  Widening of 8 culverts and repair of 35 pipe	number of cross and side drains, slab/box culverts, and Hume pipes PT: Design and	Review of detail design documents & drawings and comparison with site conditions	under preliminary design preparation by F/S	Design Consultant	PMC/RPW D-PIU-PPP

Environmental		Reference to		Monitoring	Manitarina	Mitigation	Institut Respons	
Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Costs	Implementati on	Supervisio n/Monitori ng
			culvets in Garhi-Anandapuri section.  Toll Plaza=1 at 41+00 (existing chainage)					DMO (DDW)
1.2. Pavement Design	<ul> <li>Vertical and horizontal geometrics in consistent to IRC/MORTH guidelines</li> <li>Provision of crash barriers at high embankments.</li> <li>Speed breakers in habitat areas, schools, junction and curves to regulate speed.</li> <li>Provision of retro-reflective warning signboards near school, hospital, religious places and forests</li> <li>Safety kerb at all bridgs</li> <li>Informatory signage on approach to built-up section</li> <li>Ambulance and medical aid posts</li> <li>Checking for overloading at toll plazas</li> </ul>	Design requirement  IRC:SP:73-2007 IRC:SP:84-2014 IRC:8, IRC:25, IRC:26, IRC:35, IRC:67, IRC:103 and Section 800 of MoRTH Specifications  Horizontal geometry will be based on IRC: 38-1988 and vertical geometry will be based on IRC: SP 23-1993 ".  IRC: SP: 67-2012	List of Major and Minor Junctions requiring improvements is given in Section-A of Schedule-B. All the existing junctions to be improved to the corresponding Design Vehicle and all minor junctions to be improved to 60m on side roads.  Speed Breakers and signages near built-up areas and toll plazas  1 no of Toll plaza at 41+00 (	breakers, warning sign boards, road studs, object markers etc  PT: numbers and location are in accordance with site needs.	Review of design documents and drawings and comparison with site conditions	Covered under preliminary design preparation by F/S consultant  Detailed design cost to be borne by EPC Contractor	Design Consultant	PMC/RPW D -PIU-PPP

Environmental		Reference to		Monitoring	Monitoring	Mitigation	Institutional Responsibility	
Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	Speed restrictions in built up sections curve locations etc		existing chainages)					
1.3. Drainage provisions	<ul> <li>Raised embankment and provision of roadside drainage to prevent damage to pavement due to water logging on the road and also inconvenience caused to nearby community.</li> <li>Provision of adequate nos. of cross drainage structures.</li> <li>Increased (vent and height) in waterway of existing structures.</li> <li>Roadside drains have been proposed with suitable outfalls.</li> <li>Additional culverts and bridges</li> <li>Causeway and submerged bridges to be replaced with high level bridges</li> <li>Roadside longitudinal drains to avoid water logging in built-upsections and rural sections proposed with suitable outfalls.</li> <li>Prevention of waterlogging and</li> </ul>	Provision of lined drain as per IRC: SP:42-2014 & IRC: SP:50-2013.  IRC SP: 42-2014 and IRC SP: 50-2013.  MORTH Specifications for Road and Bridge Works 5th Revision 2013	Cross-Drainages Culverts Repair of Major Bridge = 1 at Anans River ( 55+800).  Reconstruction of 6 minor bridges at CHs at 34+410, 43+512, 61+150, 65+795, 66+780 and 71+325. All existing chainages.  Reconstruction of 9 slab culverts, 5 box culverts, 75 pipe culverts.  Widening of 8 culverts and repair of 35 pipe culverts in Garhi- Anandpuri section.	MI: Monitoring of the function of cross drainage, longitudinal drainages and climate adaptation during exigencies.  PT: Standard Design and required numbers of cross and side drains, slab/ box culverts, and Hume pipes	detail design documents & drawings and	Covered under preliminary design preparation by F/S consultant  Detailed design cost to be borne by EPC Contractor	Design Consultant	PMC/RPW D-PIU-PPP

<b>F</b>		Reference to		Monitoring			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	overtopping due to intensive rainfall.		Longitudinal drains (B/S together) Footpath cum covered drains in built-up sections.  RWH at every 2km in a staggered manner on LHS and RHS in the entire project length.					
1.4. Safety along the proposed alignment	<ul> <li>Vertical and horizontal geometrics in consistent to adequate numbers of road signs and pavement markings IRC/MORTH guidelines.</li> <li>Provision of crash barriers at high embankments.</li> <li>Speed breakers in habitat areas, schools, junction and curves to regulate speed.</li> <li>Provision retroreflective warning signboards, LED traffic beacons near school, hospital,</li> </ul>	Design requirement IRC:8, IRC:25, IRC:26, IRC:35, IRC:67, IRC: 79, IRC: 99 IRC 119, and Section 800 of MoRTH Specifications	Throughout project corridor as required during construction activities, Road safety measures should be	proposed safety measures, w.r.t proposed numbers, location and site-specific needs and maintenance.  PT: Required numbers and location of crash barriers, speed breakers,	Review of design documents and drawings and comparison with site conditions  Checklists based monitoring	Covered under preliminary design preparation by F/S consultant  Detailed design cost to be borne by EPC Contractor	Design Consultant	PMC/RPW D-PIU-PPP

		Reference to		Monitoring			Institut	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Respons Implementati on	Supervisio n/Monitori ng
2. Natural Disasi	religious places and forests  Safety kerb at all bridges Informatory traffic signage/ Road markings on approach to built-up sections on Ambulance and medical aid posts  Checking for overloading at toll plazas. Speed restrictions in built up sections curve locations etc. Roadside Safety Barriers near culverts, bridges. Pedestrian Guard Rails / Footpath Facilities at Schools. Other road safety furniture comprising road signs, road markings, object markers, hazard marker, studs, delineators, attenuators, safety barriers, pedestrian guard rails, boundary stones, kilometre stone etc shall be as per Schedule-C.		Anjana, Arthoona, Kotra, Chajja, Ananapuri and Schools at 35+00, 36+500, 58+00, Schools at Agarpura, Khodan Sujaji Ka Gada, Metwala.					

		Reference to		Monitoring			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin L e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
2.1. Damage to pavement integrity like Rutting, embrittlement, softening and migration of liquid asphalt and paved surfaces	<ul> <li>Flexible Pavement Thickness is proposed for almost entire length with minimum design period of 20 years.</li> <li>CBR value of sub grade as per IRC guidelines.</li> <li>40mm BC with PMB-70 has been considered as surface course and 60mm DBM with VG-30 has been considered for Base/ binder course.</li> </ul>	IRC:37 & IRC:58 for flexible pavement design.	Entire stretch	MI: Monitoring pavement surface quality interms of roughness, cracking, rutting, softening etc.  PI:No softening, rutting, rutting, asphalt migration/thermal expansion of joints of bridges	Review of design documents and drawings and comparison with site conditions  Checklists based monitoring	Covered under preliminary design cost of F/S consultant  Detailed design cost to be borne by EPC Contractor	Design Consultant	PMC/RPW D-PIU-PPP
2.2. Flooding/ Water-Logging	<ul> <li>Adequate number of CD structures. Additional culverts also proposed.</li> <li>CD structures designed for 50 year return period.</li> <li>Water ways of bridges and culverts have been increased.</li> <li>Roadside drains also provided</li> <li>Embankment height raised along low lying/potential water-logged areas.</li> <li>Improvement in existing culverts through increase in vent size or retrofitting's.</li> </ul>	IRC:34 Recommendati ons for road construction in waterlogged area and IRC: 75 and MORT&H guidelines for Design of High Embankments	Anans River (55+800).  Reconstruction of 6 minor bridges at CHs at 34+410, 43+512, 61+150, 65+795, 66+780 and 71+325. All existing chainages.  Reconstruction of 9 slab culverts, 5 box		Review of design documents and drawings and comparison with site conditions  Checklists based monitoring	Covered under costs for DPR consultants and PPTA consultants	Design Consultant	PMC/RPW D-PIU-PPP

		Reference to		Monitoring			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	Longitudinal Drains designed so that runoff resulting from storms to a specified frequency of occurrence can be drained off immediately without overflowing or not being impounded in lower level of the Project Area and market areas.		Widening of 8 culverts and repair of 35 pipe culverts in Garhi-Anandpuri section.  Footpath cum covered drains in built-up sections.  RWH at every 2000 m in a staggered manner in the entire project length.	in accordance with site needs				
2.3. Earthquake	Relevant IS codes shall be adopted in designing the structures to sustain the magnitude of earthquake corresponding to Seismic zone of the project area	Dislodgement of superstructure shall be taken as per Clause 222 of IRC:6.	Entire Stretch	MI: Integrity of proposed structures like bridges, culverts and others.  PT: Design conforms BIS and IRC guidelines.	Review of design documents and drawings and comparison with site conditions  Checklists based monitoring	F/S consultant, Detailed design cost to be borne by concessional re	Design Consultant	PMC/RPW D-PIU-PPP
2.4. Drought	Ensure water availability for compaction work and	IRC:78-2000 Standard Specifications	Entire Stretch	MI: Monitoring GW levels, public consultations	Design and drawings of foundations	Covered under F/S	Design Consultant	PMC/RPW D-PIU-PPP

		Reference to		Monitoring			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervision n/Monitori ng
	consolidation of sub- structure	and Code of Practice for Road Bridges		with local communities.  PT: Water availability and scarcity in the region and d/s of waterways.	substructure and superstruct ure of Structures Checklists based monitoring	consultant cost		
2.5. Forest Fires	<ul> <li>Measures to avoid accident followed by fuel spills.</li> <li>Removal of maintenance slash or management by controlled burning.</li> <li>Plant fire-resistant species in RoW</li> <li>Thinning slashing during non-dry season.</li> <li>No construction camp within 500m of Notified Forest Areas.</li> </ul>	Design requirement	There is no forest along proposed road.	MI: Monitoring of likely damage to roadside flora and spillage/ fuel accumulation induced accident.  PT: Zero incidence of forest fires.		Covered under F/S consultant cost	Design Consultant	PMC/RPW D-PIU-PPP
3. Loss of Land ar	nd Assets							
3.1. livelihood loss to affected persons	<ul> <li>Road improvement work to be accommodated within available ROW to the extent possible.</li> <li>Minimize resettlement impact due to heavily congested built-up section</li> </ul>	Fair Compensation and Transparency	Refer SIA/RAP for more details	MI: Payment of compensation and assistance to DPs as per RP  Number of complaints/griev ances related to compensation and resettlement	Check LA records; design drawings vs land plans; Interview with affected persons	Part of administrativ e and resettlement costs	RPWD and implementing NGO	PMC/RPW D-PIU-PPP

Environmental		Reference to		Monitoring	Manitarina	Maidin ation	Institutional Responsibility	
Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	<ul> <li>Social Impact Assessment and Resettlement Plan to be undertaken as per national policy and ADB' guidelines.</li> <li>Complete all necessary land and property acquisition procedures prior to the commencement of civil work.</li> <li>Adhere to the Land Acquisition procedures in accordance to RP's Entitlement Framework.</li> <li>Compensation and assistance as per project Resettlement Plan</li> <li>Income restoration as per RP</li> <li>Preference in employment and petty contracts during construction to APs</li> <li>Constitute GRC as per RP</li> </ul>	ADB's involuntary resettlement policy.  Contract Clause for preference to local people during employment.		PT: Minimal number of complaints/griev ances. All cases of resettlement and rehabilitation if any are resolved at GRC level. No case referred to arbitrator/court.	Check status of employmen t given to local people during constructio n			
	rest Land and Cutting of T		Forest	MI: Monitoring	Poviou	Covered	RPWD,	PMC/RPW
4.1. Need for cutting of trees and diversion of forest land	Geometric     adjustments to     minimize tree cutting     and diversion of forest land	Forest Conservation Act, 1980	Forest Diversion = Nil Total number of affected trees= 5000	number and	Review final design. Check budget provision	Covered under preliminary design preparation	Design consultant	D-PIU

Environmental		Reference to		Monitoring	Manitarina	Mitigration	Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	<ul> <li>Obtain tree cutting permission from district revenue office/forest department.</li> <li>Provision for mandatory compensatory afforestation (1:5) for EPC Contractor.</li> <li>EPC Contractor shall be responsible for maintenance of saplings and plantations.</li> </ul>		Mandatory compensatory plantation in 1:5 ratio Overall, EPC Contractor shall plant at least 25000 saplings as compensatory afforestation as per Schedule-C.	forestland and tree cutting, budget amount allocated for compensatory afforestation and additional plantation.  PT: Avoiding or bare minimum tree felling on Govt. land/forest/ private land.	for compensat ory afforestation  Onsite validations of plantations carried out.  Checklists based monitoring	by F/S consultant  Detailed design cost to be borne by EPC Contractor		
5. Shifting of Utilit	ties		1			<u> </u>	l	
5.1. Disruption of utility services to local community		Project requirement	Throughout the corridor	MI: Number of complaints from local people, number, timing and type of notifications issued to local people, time taken to shift utilities PT: No. of complaints should be 0. Minimal time for utility shifting Checklists based monitoring	Interaction with concerned utility authorities and local public Checklists based monitoring	Included under RPWD's costs	EPC Contractor/ RPWD/utility company	AE/PMC/R PWD-PIU- PPP

Environmental		Reference to		Monitoring	B4 a mit a nim a	Mitimation	Institut Respons	
Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	potential disruption of services if any							
B. Construction S	tage							
1. Preparatory act	tivities							
1.1 Preparatory activities	Submit appointment letter and resume of the EPC Contractor's Environmental Focal Person (EFP) to PMU     EFP will engage PMC Environment Specialist and PMU Safeguard Officer-Environment to a meeting to discuss in detail the EMP, seek clarification and recommend corresponding revisions if necessary     EFP will prepare implementation schedule of the approved EMP, EMoP, and agreements reached during the meeting with PMC-ES and PMU-SOE     EFP will consult Environmental Safeguard Implementation Manual and will apply monthly monitoring formats (Checklists) and establish deadlines	Project requirement	Project Office, EPC Contractor's construction camp	Approvals, attendance Checklists based monitoring	PMC accomplish ment report Checklists based monitoring	Part construction cost for Contractor and PMC Contract	EPC Contractor/ RPWD-PPP- PIU	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	submission in							
	consultations with							
	ES(PMC) and ES (AE).							
	• EFP will submit for							
	PMC-ES approval an							
	action plan to secure							
	all permits and							
	approvals needed to							
	be secured during							
	construction stage							
	which include but not							
	limited to: i) operation of crushers and hot							
	mix plants, ii)							
	transport and storage							
	of hazardous							
	materials (e.g. fuel,							
	lubricants,							
	explosives), iii) waste							
	disposal sites, iv)							
	temporary storage location, iv) water use,							
	and v) emission							
	compliance of all							
	vehicles.							
	Arrangements to link							
	with government							
	health programs on							
	hygiene, sanitation,							
	and prevention of communicable							
	diseases will also be							
	included in the action							
	plan.							
	EFP will submit for							
	approval of PMC-ES							
	the construction camp							

		Reference to		Monitoring			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	layout before its establishment.							
1.2 Site induction	No works will be initiated by the EPC contractor until the site induction training is carried out by the PMC     Site induction training includes but not limited to: i) discussion and review of EMP and EMoP detailing how specific environmental risks associated with their Scope of Work will be managed legal compliance, inspection and audits, and progress tracking and reporting; ii) environmental training and awareness needs shall be determined and documented via a training needs analysis prior to commencement; iii) Health and Safety Awareness Course, which details general environmental awareness and specific performance requirements expected on site; and iv) GRM and v)	Project requirement	Conference/Me eting Room in construction camp of EPC Contractor or any other suitable place, adequately big enough in aerial size for observed required social distancing, where Audiovisual facilities for delivering training programmes, can be installed.	Approvals, attendance Checklists based monitoring	PMC accomplish ment report Checklists based monitoring	Part construction cost for Contractor and PMC Contract	EPC Contractor/ RPWD-PPP- PIU	AE/PMC/R PWD-PIU- PPP

Environmental		Reference to Investigation Location Monitoring indicators (MI)/	Reference to   indicators (MI)/ Monitoring Mitigation	Institut Respons				
Issue/Component	Remedial Measure	laws/guidelin e	Location	Performance Target (PT)	Methods	Costs	Implementati on	Supervisio n/Monitori ng
2. Air Quality	compliances to implementation of Community Occupational Safety & Health Plan (COSHP) for prevention and control of spread of COVID-19							
2.1 Dust Generation due to constructio3n activities and transport, storage and handling of construction materials	<ul> <li>Concessionaire to submit location and layout plan for storage areas of construction materials agreed by PD-PPP-PIU-RPWD and TL (AE).</li> <li>Transport, loading and unloading of loose and fine materials through covered vehicles.</li> <li>Paved approach roads.</li> <li>Storage areas to be located downwind of the habitation area.</li> <li>Water spraying on earthworks, unpaved haulage roads and other dust prone areas.</li> <li>Provision of PPEs to workers.</li> </ul>	MORT&H Specifications for Road and Bridge works Air (P and CP) Act 1974- Sunsequent Amendments and Central Motor and Vehicle Act 1988 General Conditions of Bid Document,	during construction activities, human habitations during commencemen t of construction activities in Paloda, Metwala, Suja	MI: NAAQS Limits, Complaints from locals due to dust.  PT: Compliances to NAAAQS Number of complaints should be zero.	Standards CPCB methods Observations Public consultation Review of monitoring data maintained by EPC contractor Checklists based monitoring	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

Emilian mantal		Reference to		Monitoring	Manitarina	B#itimation	Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
2.2 Emission of air pollutants (HC, SO2, NOX, CO	Regular     maintenance of     machinery and	The Air (Prevention and Control of	.Chainages of both habitations and schools are given in Section 15 of Schedule-A). These locations will remain as it is. Asphalt mixing plants, crushers, DG	MI: Levels of HC, SO2, NO2, and CO. Status of	Standards CPCB methods	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP
etc) from vehicles due to traffic congestion and use of equipment and machinery	equipment.	Pollution) Act, 1981 and applicable subsequent Amendments.	set's locations, Human Habitation during construction activities in Paloda, Metwala, Suja Ji Ka Gada, Khodan, Agarpurua, Garhi, Bori, Anjana, Arthoona, Kotra, Chajja, Aanadpuri and Schools at 35+00, 36+500, 58+00, Schools at Agarpura, Khodan Sujaji Ka Gada, Metwala.Palod a(Chainages of both habitations and schools are	PUC certificates  PT: Compliances to NAAQS. PUC certificates of equipment and machinery's is up to date.	Review of monitoring data maintained by EPC contractor Checklists based monitoring			

Fusingumental		Reference to		Monitoring	BA a wita win a	Mitigation	Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	after review by TL (AE).  Periodic pollution checking of all vehicles and obtaining of Pollution Under Control Certificates (PUCs) and their renewal at required periods of time.		given in Section 15 of Schedule- A).These locations will remain as it is.					
3. Noise and Vibra	ation							_
3.1 Disturbance to local residents and sensitive receptors due to excessive noise from construction activities and operation of equipment and machinery	equipment and machinery to be fitted with silencers and maintained properly.	Legal requirement Noise Pollution (Regulation and Control) Rules, 2000 and amendments thereof + Clause No 501.8.6. MORT&H Specifications for Road and Bridge works DIN 4150 and BS 7385.	construction sites and residential and sensitive locations as near schools and habitations, Paloda, Metwala, Suja Ji Ka Gada, Khodan, Agarpurua, Garhi, Bori, Anjana,	Number of complaints from local people  PT: Zero complaints or no repeated	Noise rule, 2000 UNI 9916 "Criteria for measuring and assessing the effects of vibration on buildings"		EPC Contractor	AE/PMC/R PWD-PIU- PPP

Environmental		Reference to		Monitoring	Manitanina	B#itioreties	Institut Respons	
Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	noise beyond standards.  Restrict construction near residential, built up and forest areas construction to day light hours.  Conduct condition surveys of all properties within 25 meters from road edge  Vibration monitoring during heavy machinery/ equipment operation  Honking restrictions near sensitive areas.  PPEs to workers  Noise monitoring as per EMoP.		(Chainages of both habitations and schools are given in Section 15 of Schedule-A). These locations will remain as it is.		Observation of construction site  Checklists based monitoring			
4. Land and Soil								
4.1 Land use Change and Loss of productive / topsoil	<ul> <li>Non-agricultural areas to be used as borrow areas to the extent possible.</li> <li>If using agricultural land, top soil to be preserved and laid over either on the embankment slope for growing vegetation to protect soil erosion.</li> <li>Land for temporary facilities like construction camp, storage areas etc.</li> </ul>	Project requirement, Applicable ADB and IRC Guidelines	Throughout the project section and borrow areas  Land identified for camp, storage areas etc.		Review borrow area plan, site visits Checklists based monitoring	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

Environmental		Reference to		Monitoring	Manitanina	Mitigration	Institut Respons	
Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	shall be brought back to its original land use							
4.2 Slope failure and Soil erosion due to Construction activities, earthwork, and cut and fill, stockpiles etc.	embankments to protect slopes.  • Slope protection by providing	IRC: 56 -1974 recommended practice for treatment of embankment slopes for erosion control Clause No. 306 and 305.2.2 MORT&H Specifications for Road and Bridge works Guidelines IX for Soil erosion	Throughout the entire project road for example retaining walls/ toe walls are proposed. Slope protection events has been proposed with stone pitching at various near sites.	MI: Occurrence of slope failure or erosion issues.  PT: No slope failures. Minimal erosion issues	Review of design documents and site observation  Checklists based monitoring	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP
4.3 Borrow area management		IRC Guidelines on borrow areas and for quarries (Environmental protection Act and Rules, 1986; Water Act, Air Act)+Clause	Borrow sites /locations	MI: Existence of borrow areas in inappropriate unauthorized locations. Poor borrow area management practices. Number of accidents.	Review of design documents and site observation s  Checklists based monitoring	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

Environmental		Reference to		Monitoring	Manitanina	Mitigration	Institut Respons	
Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
		MORTH Specifications for Road and Bridgeworks,		Complaints from local people.  PT: No case of non-compliance with Applicable ADB and IRC Guidelines. Zero accidents. Zero complaints  No use of black cotton soil. Checklists based monitoring				

Environmental	Remedial Measure  Reference to laws/guidelin  Reference to laws/guidelin  Location  Monitoring indicators (MI)/ Performance  Methods  Costs	B#14" 4"	Respons	ional sibility				
Issue/Component	demediai measure	laws/guidelin e	Location	Performance Target (PT)			Implementati on	Supervisio n/Monitori ng
management  in the second of t	shall be used for borrowing earth with the necessary permissions/consents.  Depths of borrow pits to be regulated and sides not steeper than 25%.  Topsoil to be stockpiled and protected for use at the rehabilitation stage.  Transportation of earth materials	IRC Guidelines on borrow areas and for quarries (Environmental protection Act and Rules, 1986; Water Act, Air Act) + Clause 305.2.2 MORTH Specifications for Road and Bridgeworks, Applicable ADB and IRC Guidelines for Borrow Areas management	Borrow Area sites	MI: Existence of borrow areas in inappropriate unauthorized locations. Poor borrow area management practices. Numtestesber of accidents. Complaints from local people.  PT: No case of non-compliance with applicable ADB and IRC Guidelines. Zero accidents. Zero accidents. Zero complaints No use of black cotton soil	Review of design documents and site observation s  Checklists based monitoring	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

Environmental		Reference to		Monitoring indicators (MI)/	Monitoring	Mitigation	Institut Respons	
Issue/Component	Remedial Measure	laws/guidelin e	n Location	Performance Target (PT)	Methods	Costs	Implementati on	Supervisio n/Monitori ng
4.5 Quarry	soil. Else, it shall be converted into fish pond.  • EPC Contractor to submit copies of STPs/ Land Owners Consent Letters.  • Aggregates will be	Clause	New Quarry if	MI: Existence of	Review of	Included in	EPC	AE/PMC/R
Operations	sourced from existing licensed quarries.  Copies of consent/ approval / rehabilitation plan for a new quarry or use of existing source will be submitted to AE/RPWD-PIU-PPP/PMC.  The contractor will develop a Quarry Redevelopment plan, as per the Mining Rules of the state and submit a copy of the approval to EA.  Obtain environmental clearance from SEIAA /DEIAA in case of opening new quarry.  Observe compliance to EC Conditions.	No.111.3 MORT&H Specifications for Road and Bridge works Guidelines VI for Quarry Areas Management Environmental Protection Rules	needed and existing Quarries	licenses quarry areas from which materials to be sourced and Existence of a quarry redevelopment plan  PT: Quarry license is valid.: No case of noncompliance to consent conditions and air quality meets the prescribed limit	design documents, contractor documents and site observation  Complianc e to EC conditions in case of opening new quarries  Checklists based monitoring	civil works cost	Contractor	PWD-PIU- PPP
4.6 Compaction of soil and impact on quarry haul roads due to movement of	Construction vehicles, machinery, and equipment to be stationed in the designated ROW to avoid compaction.	Design requirement	Parking areas, Haulage roads and construction yards.	MI: Location of approach and haulage roads Presence of destroyed/comp acted agricultural	Site observation Checklists based monitoring	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
vehicles and equipment	<ul> <li>Approach roads/haulage roads shall be designed along the barren and hard soil area to reduce the compaction.</li> <li>Transportation of quarry material to the dumping site through heavy vehicles shall be done through existing major roads to the extent possible to restrict wear and tear to the village/minor roads.</li> <li>Land taken for construction camp and other temporary facility shall be restored to its original conditions.</li> </ul>			land or land which has not been restored to its original condition PT: Zero occurrence of demolished/ compacted land and undemolished land.				
4.7 Contamination of soil due to leakage/ spillage of oil, bituminous and non-bituminous debris generated from demolition and road construction	<ul> <li>Construction         vehicles         and equipment will         be maintained and         refueled in such a         fashion that oil/diesel         spillage does not         contaminate the soil.</li> <li>Fuel storage and         refueling sites to be         kept away from         drainage channels.</li> <li>Unusable debris         shall be dumped in</li> </ul>	Design requirement	Fueling station, construction sites, and construction camps and disposal location.  No material should be disposed in water bodies water bodies after Mor, Metwala (RHS),	MI: Quality of soil near storage area Presence of spilled oil or bitumen in project area  PT: Soil test conforming to no—contamination. No sighting of spilled oil or bitumen in	Site observation Checklists based monitoring	Included in civil work cost.	EPC Contractor	AE/PMC/R PWD-PIU- PPP

Environmental		Reference to		Monitoring	Monitoring	Mitigation	Institut Respons	
Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
5. Water Resource	ditches and low lying areas.  To avoid soil contamination Oil-Interceptors shall be provided at wash down and refueling areas.  Waste oil and oil soaked cotton/ cloth shall be stored in containers labeled 'Waste Oil' and 'Hazardous' sold off to MoEF/SPCB authorized vendors  Non-bituminous wastes to be dumped in borrow pits with the concurrence of landowner and covered with a layer of topsoil conserved from opening the pit.  Bituminous wastes will be disposed off in an identified dumping site approved by the State Pollution Control Board		at), at 34+00 (LHS), at 36+900, 52+700 (LHS) River at 55+600	construction site or camp site Checklists based monitoring				
5.1 Sourcing of water during Construction		CGWA Guidelines	Throughout the Project section  Water harvesting	MI: Approval from competent authority Complaints from local people on water availability	Checking of documentat ion  Talk to local people	Included in civil work cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring			Institut Respons	
Environmental Issue/Component		laws/guidelin Location e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	<ul> <li>Arrangements shall be made by EPC contractor that the water availability and supply to nearby communities remain unaffected.</li> <li>Water intensive activities not to be undertaken during summer season.</li> <li>Provision of water harvesting structure to augment recharging of groundwater conditions (aquifers) in the project area.</li> <li>Permissions from Local Irrigation Department, in case using canal water.</li> <li>Agreement letters with local level water suppliers.</li> </ul>		structure at toll plaza	PT: Valid approval from competent authority. Zero complaints from local people. Checklists based monitoring				
5.2 Disposal of water during construction	<ul> <li>Provisions shall be made to connect road side drains with existing nearby natural drains.</li> <li>All hand pumps and wells are proposed for relocation at suitable locations in consultation with local community.</li> </ul>	Clause No.1010 EP Act 1986 MORT&H Specifications for Road and Bridgeworks	Project section. No wastewater should be disposed of in water bodies after Mor, Metwala (RHS), at), at 34+00	MI: Condition of drainage system in construction site. Presence /absence of water logging in project area.  PT: Existence of proper drainage system. No water logging in project area	Standards methods Site observation and review of documents		EPC Contractor	AE/PMC/R PWD-PIU- PPP

Eminor montal		Reference to		Monitoring	Ba i4 i	Baltimetien	Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin L e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	Water harvesting structures have been proposed along the project road subject to technical feasibility as per guidelines of CGWB. These measures will significantly augment the ground water/surface water availability in the area							
5.3 Alteration in surface water hydrology	<ul> <li>Existing drainage system to be maintained and further enhanced.</li> <li>Provision shall be made for adequate size and number of cross drainage structures esp. in the areas where land is sloping towards road alignment.</li> <li>Road level shall be raised above HFL level wherever road level is lesser than HFL.</li> <li>No construction will be established within 500mts of a water body.</li> <li>Culverts reconstruction shall not be done during lean flow period. In some cases these</li> </ul>	Design requirement, Clause No 501.8.6. MORT&H Specifications for Road and Bridge	Near all drainage channels, river/nallah crossings etc. Water bodies after Mor, Metwala (RHS), at), at 34+00 (LHS), at 36+900, 52+700 (LHS River at 55+600		Review of design documents Site observation	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

Environmental		Reference to		Monitoring	Manitaring	Mitigation	Institut Respons	
Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	minor channels may be diverted for a very short period (15-30 days) and will be bring back to its original course immediately after construction.  The design of drainage system such as surface and subsurface drainage will be carried out as per IRC: SP: 42 and IRC: SP: 50. Surface runoff from the main highway, embankment slopes and the service roads will be discharged							
	through longitudinal drains, designed for adequate cross section, bed slopes, invert levels and the outfalls. If necessary, the walls of the drains will be designed to retain the adjoining earth.  The design discharge will be evaluated for flood of 50-year return period for calculation of waterway and design of foundations. Proposed water way will not be reduced from existing one.							

		Reference to		Monitoring			Institut	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Respons Implementati on	Supervisio n/Monitori ng
	Linear waterways of the							
	The design of drainage							
	system such as							
	surface and sub-							
	surface drainage will							
	be carried out as per							
	IRC: SP: 42 and IRC:							
	SP: 50. Surface runoff							
	from the main							
	highway,							
	embankment slopes							
	and the service roads							
	will be discharged							
	through longitudinal							
	drains, designed for							
	adequate cross section, bed slopes,							
	invert levels and the							
	outfalls. If necessary,							
	the walls of the drains							
	will be designed to							
	retain the adjoining							
	earth.							
	The design discharge							
	will be evaluated for							
	flood of 50-year return							
	period for calculation							
	of waterway and							
	design of foundations.							
	Proposed water way							
	will not be reduced from existing one.							
	Linear waterways of							
	the most of the major							
	rivers are bank to							
	bank. Therefore,							
	proposed bridge							

		Reference to		Monitoring			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	length will be bank to bank.							
	The design of drainage							
	system such as							
	surface and sub-							
	surface drainage will							
	be carried out as per							
	IRC: SP: 42 and IRC: SP: 50. Surface runoff							
	from the main							
	highway,							
	embankment slopes							
	and the service roads							
	will be discharged							
	through longitudinal							
	drains, designed for							
	adequate cross							
	section, bed slopes, invert levels and the							
	outfalls. If necessary,							
	the walls of the drains							
	will be designed to							
	retain the adjoining							
	earth.							
	The design discharge							
	will be evaluated for							
	flood of 50-year return							
	period for calculation of waterway and							
	of waterway and design of foundations.							
	Proposed water way							
	will not be reduced							
	from existing one.							
	Linear waterways of							
	the most of the major							
	rivers are bank to							
	bank. Therefore,							
	proposed bridge							1

Environmental		Reference to		Monitoring	Monitorina	Mitigation	Institut Respons	
Issue/Component	Remedial Measure	e Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng	
	length will be bank to bank.							
5.4 Siltation in water bodies due to construction activities /earthwork	<ul> <li>Embankment         slopes to be         modified suitably to         restrict the soil debris         entering water bodies.</li> <li>Provision of Silt         fencing shall be made         at water bodies.</li> <li>Silt/sediment should         be collected and         stockpiled for possible         reuse as surfacing of         slopes where they         have to be re-         vegetated.</li> <li>Earthworks and stone         works to be prevented         from impeding natural         flow of rivers, streams         and water canals or         existing drainage         system.</li> <li>Retaining walls at         water bodies /ponds to         avoid siltation near         ponds.</li> <li>No construction camp         within 500m of any         water body</li> <li>Locate all parking,         repair and fuel and         hazardous material         storage area away         from any water body.         Vehicle parking and</li> </ul>	Design requirement, ClauseNo501. 8.6.MORT&H Specifications for Road and Bridgeworks  Worldwide best practices	wastewater should be disposed off in water bodies after Mor, Metwala (RHS), at), at 34+00	MI: Presence /absence of siltation in rivers, streams, ponds and other water bodies in project area. Turbidity test levels  PT: No records of siltation due to project activities. Surface water quality tests confirm to turbidity and TSS limit	Field observation	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

Environmental		Reference to		Monitoring indicators (MI)/	Monitoring	Mitigation	Institut Respons	
Issue/Component	Remedial Measure	laws/guidelin e	Location	Performance Target (PT)	Methods	Costs	Implementati on	Supervisio n/Monitori ng
	maintenance areas will have waterproof floors from which drainage is collected and treated to legal standards.  Refuel vehicles only in dedicated areas with waterproof floors from which drainage flows to an oil/water separator before discharge							
5.5 Deterioration in Surface water quality due to leakage from vehicles and equipment and waste from construction camps.	<ul> <li>No vehicles or equipment should be parked or refueled near water-bodies, so as to avoid contamination from fuel and lubricants.</li> <li>Oil and grease traps and fueling platforms to be provided at refueling locations.</li> <li>All chemicals and oil shall be stored away from water and concreted platform with catchment pit for spills collection.</li> <li>All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-</li> </ul>	The Water (Prevention and Control of Pollution) Act, 1974 and amendments thereof./ as well as IS-10500:2012	Water bodies, refueling stations, construction camps. No waster waster should be disposed off in water bodies after Mor, Metwala (RHS), at), at 34+00 (LHS), at 36+900, 52+700 (LHS) River at 55+600	MI: Water quality of ponds, streams, rivers and other water bodies in project  Presence of oil floating in water bodies in project area  PT: Surface water quality meets freshwater quality standards prescribed by CPCB Checklists based monitoring	Conduction of water quality tests as per the monitoring plan Field observation	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

Emailian		Reference to		Monitoring	BA a self a self-se	B#141 41	Institutional Responsibility	
Environmental Issue/Component		laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	up. Readily available,							
	simple to understand							
	and preferably written in the local language							
	emergency response							
	procedure, including							
	reporting, will be							
	provided by the							
	contractors.							
	Construction camp to							
	be sited away from							
	water bodies. No							
	construction camp							
	within 500mts of water							
	body.							
	<ul> <li>Wastes must be</li> </ul>							
	collected, stored and							
	taken to approve							
	disposal site only.							
	Water quality shall be							
	monit							
	Locate all parking,							
	repair and fuel and hazardous material							
	storage area away							
	from any water body.							
	Vehicle parking and							
	maintenance areas							
	will have waterproof							
	floors from which							
	drainage is collected							
	and treated to legal							
	standards.							
	Refuel vehicles only in							
	dedicated areas with							
	waterproof floors from							
	which drainage flows							
	to an oil/water							

Environmental		Reference to		Monitoring indicators (MI)/	Monitoring	Mitigation	Institut Respons	
Issue/Component	Remedial Measure	laws/guidelin e	Location	Performance Target (PT)	Methods	Costs	Implementati on	Supervisio n/Monitori ng
6. Flora and Faun 6.1 6.1 Vegetation loss due to site preparation and construction activities	<ul> <li>Restrict tree cutting up to toe line considering safety to road users.</li> <li>Roadside trees to be removed with prior approval of competent authority.</li> <li>Mandatory compensatory plantation at 1:5 basis by EPC Contractor.</li> <li>Regular maintenance</li> </ul>	Forest Conservation Act1980 + IRC:SP:21 and IRC:SP:66	Throughout project corridor  Estimated No. of affected trees = 5000 tress.  Compensatory Plantation on1:5 basis.	MI: ROW width Number of trees for felling Compensatory plantation plan Number of trees replanted. PT: Compensatory afforestation done on a 1:3	relevant documents - tree cutting permit, compensat ory plantation plan. and additional plantation	Mandatory Compensato ry afforestation cost is included in project costs under RPWD	•	AE/PMC/R PWD-PIU-
	<ul> <li>trees planted.</li> <li>Provision of LPG in construction camp as fuel source to avoid tree cutting.</li> <li>Plantation of trees on both sides of the road where technically feasible. Trees should be offset 1m back from the ultimate edge of the roadway to prevent safety hazard and provide adequate sight distance.</li> <li>Integrate vegetation management (IVM) with the carriage way completely clear of vegetation.</li> <li>Controlled use of pesticides/ fertilizers</li> </ul>		EPC Contractor shall do 25000 nos. of sapling plantations as per Schedule-C.	basis by EPC Contractor. Checklists based monitoring	strategy Field observation s			

	nvironmental		Reference to		Monitoring	Manitarina	Mitimation	Institut Respons	
	ue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
7	Construction C	amne							
7.1	Impact associated with location	All camps should be established with prior permission from PCB. Camps to maintain minimum distance from following:     # 500 m from habitation     # 500 m from forest areas where possible     # 500 m from water bodies where possible     # 500 m from through traffic route     # 500 m from identified wildlife crossing areas     # 500 m within a waterbody	Design Requirement As identified in IEE, All applicable laws, rules and regulations including Contract Labour laws as well as, EHS policy and rules.	Construction camp	MI: Location of campsites and distance from habitation, forest areas, water bodies, through traffic route and construction camps PT: Distance of campsite is less than 500m from listed locations	On site observation Interaction with workers and local community Checklists based monitoring	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP
7.2	Worker's Health in construction camp	The location, layout and basic facility provision of each labor camp will be submitted to AE and approved by PD-PIU-PPP-RPWD. The EPC contractor will maintain necessary living accommodation and ancillary facilities in hygienic manner.  Adequate water and sanitary latrines with septic tanks with soak pits shall be provided.	The Building and Other Construction workers (Regulation of Employment and Conditions of service) Act 1996 and The Water (Prevention and Control of Pollution) Act, 1974 and amendments thereof	All construction camps	MI: Camp health records, Compliance to SOPs of COSHP for COVID-19 Protection.  Existence of proper first aid kit in camp site Complaints from workers.	Camp records  Site observation  Consultatio n with contractor workers and local people living nearby	Part of the civil works costs	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	<ul> <li>Preventive medical facilities in camp</li> <li>Waste disposal facilities such as dust bins must be provided in the camps and regular disposal of waste The EPC Contractor will take all precautions to protect the workers from insect and pest to reduce the risk to health. This includes the use of insecticides which should comply with local regulations.</li> <li>No liquor or prohibited drugs will be imported to, sell, give and barter to the workers of host community.</li> <li>Awareness raising to immigrant workers/local community on communicable and sexually transmitted diseases.</li> <li>Compliance to SOPs of COSHP for COVID-19 Protection.</li> </ul>			PT: No record of illness due to unhygienic conditions or vectors. Zero cases of STD. Clean and tidy camp site conditions. Compliance to SOPs of COSHP for COVID-19 Protection. Checklist based monitoring				
	f Construction Waste/Debris			T	1	[	1	I
Dumping Sites	''	Requirement, MORT&H guidelines and General	Dumping/Dispo sal Sites.	complaints.	Field survey and interaction with local people.	Included in civil works cost.	EPC Contractor	AE/PMC/R PWD-PIU- PPP

F		Reference to		Monitoring		B.8****	Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	<ul> <li>Create controlled dumping sites with a non-permeable lining incorporated in the pit design to avoid leachate seepage into the soil, which may later affect ground water quality</li> <li>Unproductive/wastela nds shall be selected for dumping sites away from residential areas and water bodies</li> <li>Dumping sites must be having adequate capacity equal to the number of debris generated.</li> <li>Public perception and consent from the village Panchayats has to be obtained before finalizing the location.</li> </ul>	Conditions of Contract Document, Construction and Demolition Waste Management Rules-2016 and subsequent Amendments.	any types of wastes in water bodies. Water bodies after Mor, Metwala (RHS), at), at 34+00 (LHS), at 36+900, 52+700 (LHS River at 55+600	complaints. Consent letters for all dumping sites available with contractor  Checklists based monitoring	Review of consent letter			
8.2 Reuse and disposal of construction and dismantled waste	The existing bitumen surface shall be utilized for paving of cross roads, access roads, and paving works in construction sites and camps, temporary traffic diversions, and haulage routes.  All excavated materials from	Design Requirement, MORT&H guidelines and General Conditions of Contract Document  Construction and Demolition Waste	Throughout the project corridor	of reuse of existing surface material  Method and location of	Contractor records Field observation Interaction with local people	Included in civil works cost.		

		Reference to		Monitoring			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping.  • Unusable and non-bituminous debris materials should be suitably disposed off at pre-designated disposal locations, with approval of the concerned authority.  • The bituminous wastes shall be disposed in secure landfill sites only in environmentally accepted manner. For removal of debris, wastes and its disposal, MORTH guidelines should be followed.  • Unusable and surplus materials, as determined by the Project Engineer, will be removed and disposed off-site.	Management Rules 2016 and subsequent Amendments.		PT: No public complaint and consent letters for all dumping sites available with contractor or AE. Checklists based monitoring				
	ment and Safety		T				1	
9.1 Management of existing traffic and safety	Traffic Management Plan shall be submitted by the contractor and approved by the AE	Design requirement and IRC: SP: 27 - 1984, Report Containing	Throughout the project corridor especially at intersections.		Review traffic manageme nt plan Field observation	Included in civil works cost.	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	The traffic control plans shall contain details of diversions; traffic safety arrangements during construction; safety measures for night time traffic and precautions for transportation of hazardous materials. Timing and scheduling to be done so that transportation of dangerous goods is done during least number of people and other vehicles on the road.  The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.	Recommendati on of IRC Regional Workshops on Highway Safety IRC:SP: 32 - 1988 Road Safety for Children (5-12 Years Old) in Construction Zones IRC:SP:55- 2014		site. Complaints from road users. No of accidents PT: No complaints. No accidents due to	of traffic manageme nt and safety system Interaction with people in vehicles using the road			
	On stretches where it is not possible to pass the traffic on the part width of existing carriageway, temporary paved diversions will be constructed.	The Building and other Construction workers Act 1996 and Cess Act of 1996 Factories Act 1948+Section 6 of Employer's						

Environmental		Reference to		Monitoring	Manitarina	Mitigation	Institut Respons	
Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	<ul> <li>Restriction of construction activity to only one side of the existing road</li> <li>The contractor shall inform local community of changes to traffic routes, and pedestrian access arrangements with assistance from "AE".</li> <li>Use of adequate signage's to ensure traffic management and safety. Conduct of regular safety audit on safety measures.</li> </ul>	Requirement of Bid Document						
9.2 Pedestrians, animal movement	<ul> <li>Temporary access and diversion, with proper drainage facilities.</li> <li>Access to the schools, temples and other public places must be maintained when construction takes place near them.</li> <li>Fencing wherever animal movement is expected.</li> <li>Large number of box culverts has been proposed.All structures having vertical clearance above 2m and not catering to perennial</li> </ul>	Same as above	Near habitation on both sides of schools, temples, construction sites, haulage roads, diversion sites.	MI: Presence/ absence of access routes for pedestrians. Road signage Number of complaints from local people  PT: Easy access to schools, temples and public places. Zero complaints Checklists based monitoring	Field observation Interaction with local people	Included in civil works cost.	EPC Contractor	AE/PMC/R PWD-PIU- PPP

Environmental		Reference to		Monitoring	Monitorin	Mitigation	Institut Respons	
Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Costs	Implementati on	Supervisio n/Monitori ng
	flow of water may serve as underpass for animals							
9.3 Safety of Workers and accident risk from construction activities	<ul> <li>Contractors to adopt and maintain safe working practices.</li> <li>Usage of fluorescent and retro refectory signage, in local language at the construction sites</li> <li>Training to workers on safety procedures and precautions.</li> <li>Mandatory appointment of safety officer.</li> <li>All regulations regarding safe scaffolding, ladders, working platforms, gangway, stair wells, excavations, trenches and safe means of entry and egress shall be complied with.</li> <li>Provision of PPEs to workers.</li> <li>Provision of a readily available first aid unit including an adequate supply of dressing materials.</li> <li>The contractor will not employ any person</li> </ul>	Same as above	Construction sites	MI: Availability of Safety gears to workers  Safety signage Training records on safety  Number of safety related accidents  PT: Zero fatal accidents. Zero or minor nonfatal accidents.  Checklists based monitoring	Site observation Review records on safety training and accidents Interact with construction workers	Included in civil works cost	Obligation of EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
9.4 Accident risk to local community	below the age of 18years  Use of hazardous material should be minimized and/or restricted.  Emergency plan (to be approved by engineer) shall be prepared to respond to any accidents or emergencies.  Compliance to Community Occupational Health & Safety Plan (COSHP) for COVID-19.  Accident Prevention Officer must be appointed by the contractor.  Restrict access to construction sites only to authorized personnel.  Physical separation must be provided for movement of vehicular and human traffic.  Adequate signage must be provided for safe traffic movement Provision of temporary diversions and awareness to locals	Same as above	Construction sites	and their location, Incidents of accidents,	Site inspection Consultatio n with local people	Included in civil works cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP

		Reference to		Monitoring			Institut Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervicio
	before opening new construction fronts.							
10. Site restoration	and rehabilitation							
10.1 Clean-up Operations, Restoration and Rehabilitation	<ul> <li>Contractor will prepare site restoration plans, which will be approved by the AE.</li> <li>The clean-up and restoration operations are to be implemented by the contractor prior to demobilization.</li> <li>All construction zones including river-beds, culverts, road-side areas, camps, hot mix plant sites, crushers, batching plant sites and any other area used/affected by the project will be left clean and tidy, to the satisfaction of the Environmental Specialist (PMC), Environmental Specialist (AE) and Environmental Focal Person (EPC Contractor).</li> <li>All the opened borrow areas will be rehabilitated and 'AE' will certify</li> <li>Maintenance stage</li> </ul>	Project requirement	Throughout the project corridor, construction camp sites and borrow areas	camp, borrow areas and construction sites, Presence/ absence of construction material/debris after completion of construction works on site. PT: Clean and tidy sites. No trash or debris left on site. Site	Site observation Interaction with locals Issue completion certificate after restoration of all sites are found satisfactory Post-construction Checklists based monitoring	Included in civil works cost.	EPC Contractor	AE/PMC/R PWD-PIU- PPP
1. Air Quality	manitorianoe stage							
i. All Quality								

Environmental ssue/Component	Remedial Measure	Reference to laws/guidelin e	Location	Monitoring indicators (MI)/ Performance	Monitoring Methods	Mitigation Costs		
1.1 Air pollution	Roadside tree		Throughout the	Target (PT)  MI: Ambient air	As per	Included in	on Implementation	ng by EPC
due to due to vehicular movement	<ul> <li>Roadside tree plantations shall be maintained at least with 70% survival rate.</li> <li>Regular maintenance of the road will be done to ensure good surface condition</li> <li>Ambient air quality monitoring. If monitored parameters exceeds prescribed limit, suitable control measures must be taken.</li> <li>Signages shall be provided reminding them to properly maintain their vehicles to economize on fuel consumption.</li> <li>Enforcement of vehicle emission rules in coordination with transport department or installing emission checking equipment. Obtaining of Pollution Under Control Certificates (PUCs) and their renewal on periodic basis.</li> </ul>	Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981, Motor Vehicles Act 1948 and subsequent Amendments	Corridor. Human Habitations during commencemen t of road	quality (PM10, CO, SO2 NO2) PT: Levels are equal to or below baseline levels given in the IEE	As per CPCB requirements  Site inspection	Operation / Maintenance cost	Contractor and & monitori AE/PMC/RPWD	Supervision ng by

Environmental		Reference to		Monitoring	Monitorina	Mitigation	Institut Respons	
Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
2.1 Noise due to movement of traffic	<ul> <li>Effective traffic management and good riding conditions shall be maintained</li> <li>Speed limitation to 20 km/hour and honking restrictions near sensitive receptors</li> <li>Monitoring of Performance of Noise Barriers constructed and New Construction of any further required noise barriers near sensitive receptors with consent of local community</li> <li>Create awareness amongst the residents about likely noise levels from road operation at different distances, the safe ambient noise limits and easy to implement noise reduction measures while constructing a building near road.</li> </ul>	Noise Pollution (Regulation and Control) Rules, 2000 and amendments thereof	Residential and sensitive locations location s of air quality monitoring. Human Habitation during commencemen t of road operation in Paloda, Metwala, Suja Ji Ka Gada, Khodan, Agarpurua, Garhi, Bori, Anjana, Arthoona, Kotra, Chajja, Ananapuri and Schools at 35+00, 36+500, 58+00, Schools at Agarpura, Khodan Sujaji Ka Gada, Metwala. (Chainages of both habitations and schools are given in Section 15 of Schedule-	MI: Noise levels  PT: Levels are equal to or below baseline levels given in the IEE report  Checklists based monitoring	Noise monitoring as per noise rules, 2000  Discussion with people at sensitive receptor sites	Included in Operation / Maintenance cost	Implementation Contractor and & monitor AE/PMC/RPWD	Supervision ring by

Environmental		Reference to		Monitoring indicators (MI)/	Monitoring	Mitigation	Institutional Responsibility
Issue/Component	Remedial Measure	laws/guidelin e	Location	Performance Target (PT)	Methods	Costs	Implementati on Supervisio n/Monitori ng
3.1 Soil erosion at embankment during heavy rainfall.	<ul> <li>Periodic checking to be carried to assess the effectiveness of the stabilization measures viz. turfing, stone pitching, river training structures etc.</li> <li>Necessary measures to be followed wherever there are failures</li> </ul>	Project requirement	At embankment slopes and other probable soil erosion areas.	MI: Existence of soil erosion sites Number of soil erosion sites  PT: Zero or minimal occurrences of soil erosion. Checklists based monitoring.	On site observation	Included in Operation / Maintenance cost	Implementation by EPC Contractor and Supervision & monitoring by AE/PMC/RPWD-PIU-PPP
	s/Flooding and Inundation		1				
4.1 Siltation	Regular checks shall be made for soil erosion conditions for its effective maintenance.	Project requirement	Near surface Water bodies. water bodies after Mor, Metwala (RHS), at), at 34+00 (LHS), at 36+900, 52+700 (LHS River at 55+600. No waste or waste water should be disposed off in these water bodies.	MI: Water quality PT: No turbidity of surface water bodies due to the road Checklists based monitoring	Site observation	Included in Operation / Maintenance cost	Implementation by EPC Contractor and Supervision & monitoring by AE/PMC/RPWD-PIU-PPP
4.2 Water logging due to blockage of drains, culverts or streams	Regular visual checks and cleaning (at least once before monsoon) of drains to ensure that flow of water is maintained through cross drains and other channels/streams.	Project requirement IRC: SP:21- 2009	Near surface Water bodies/cross drains/side drains	MI: Presence/ absence of water logging along the road  PT: No record of overtopping/ Water logging.	Site observation	Included in Operation / Maintenance cost	Implementation by EPC Contractor and Supervision & monitoring by AE/PMC/RPWD-PIU-PPP

	invironmental		Reference to		Monitoring indicators (MI)/	Monitoring	Mitigation	Institut Respons	
	sue/Component	Remedial Measure	laws/guidelin e	Location	Performance Target (PT)	Methods	Costs	Implementati on	Supervisio n/Monitori ng
		<ul> <li>Monitoring of water borne diseases due to stagnant water bodies</li> </ul>			Checklists based monitoring				
5.	Flora		le	In the state of th	NAL Transfellente	In	II I . I . I	11	, EDO
5.1	Vegetation	<ul> <li>Planted trees, shrubs, and grasses to be properly maintained.</li> <li>The tree survival audit to be conducted at least once in a year to assess the effectiveness</li> </ul>	Forest Conservation Act 1980	Project tree plantation sites	MI: Tree/plants survival rate  PT: Minimum rate of 70% tree survival Checklists based monitoring	Records and field observation s. Information from Forestry Departmen t	Included in Operation / Maintenance cost	Implementation Contractor and & monito AE/PMC/RPWI	Supervision ring by
6.		Right of Way and Safety			_		T	_	
6.1	due to uncontrolled growth of vegetation	completely clear of vegetation.  Minimum offset as prescribed in IRC:SP:21-2009 to be maintained  Regular maintenance/trimming of plantation along the road side  No invasive plantation near the road.	Project requirement IRC: SP:21- 2009	Throughout the Project route	MI: Presence and extent of vegetation growth on either side of road. Number of accidents. PT: No accidents due to vegetation growth. Checklists based monitoring	Visual inspection Check accident records	Included in Operation / Maintenance cost	Implementation Contractor and & monito AE/PMC/RPWI	Supervision ring by
6.2	Accident risks associated with traffic movement.	<ul> <li>Traffic control measures, including speed limits, will be enforced strictly.</li> <li>Further encroachment of squatters within the ROW will be prevented.</li> </ul>	IRC:SP:55- 2014/And IRC:SP:88- 2010	Throughout the Project route	MI: Number of accidents Conditions and existence of safety signs, rumble strips etc. on the road Presence/absence of sensitive	Review accident records Site observation s	Included in Operation / Maintenance cost	Implementation Contractor and & monito AE/PMC/RPWI	Supervision ring by

Fundamental		Reference to		Monitoring	Ba i4 i	Baidi wadi aw	Instituti Respons	
Environmental Issue/Component	Remedial Measure	laws/guidelin e	Location	indicators (MI)/ Performance Target (PT)	Monitoring Methods	Mitigation Costs	Implementati on	Supervisio n/Monitori ng
	<ul> <li>Monitor/ensure that all safety provisions included in design and construction phase are properly maintained</li> <li>Highway patrol unit(s) for round the clock patrolling. Phone booth for accidental reporting and ambulance services with minimum response time for rescue of any accident victims, if possible.</li> <li>Tow-way facility for the breakdown vehicles if possible.</li> <li>Road furniture shall be as per Schedule-C and applicable IRC Codes.</li> <li>Road Safety Audit should be conducted on regular basis</li> </ul>			receptor structures inside the stipulated planning line as per relevant local law  PT: Fatal and non fatal accident rate is reduced after improvement Checklists based monitoring				
6.3 Transport of Dangerous Goods	<ul> <li>Existence of spill prevention and control and emergency responsive system</li> <li>Emergency plan for vehicles carrying hazardous material</li> </ul>	-	Throughout the project stretch	MI: Status of emergency system – whether operational or not  PT: Fully functional emergency system.	spill prevention and	Included in Operation / Maintenance cost	Implementation Contractor and & monitor AE/PMC/RPWD	Supervision ing by

	Environmental Issue/Component	Remedial Measure	Reference to laws/guidelin Locati		I ocation   ' '	Monitoring	Mitigation Costs	Institutional Responsibility	
				Location		Methods		Implementati on	Supervisio n/Monitori ng
					Checklists based				
Į					monitoring				

EFP: Environmental Focal Person, RPWD: Rajasthan State Public Works Department, NPK: Nitrogen, Phosphorous and Potassium, PMC: Project Management Consultant, AE: Authority Engineer, IEE: Initial Environmental Examination, IRC: Indian Road Congress, DEIAA: District Environmental Impact Assessment Authority, SEIAA: State Environmental Impact Assessment Authority, CPCB: Central Pollution Control Board, IS: Indian Standard

## ENVIRONMENTAL MONITORING PLAN FOR PALODA-GARHI-ANANDPURI ROAD

Env. Indicator s	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervision /Monitoring
Air Quality	Constructio n stage	PM 10 PM 2.5 SO2, NOX, CO	High volume sampler to be located 50 m from the selected locations in the downwind direction. Use method specified by CPCB	Human Habitation during commencement of construction activities in Paloda, Metwala, Suja Ji Ka Gada, Khodan, Agarpura, Garhi, Bori, Anjana, Arthoona, Kotra, Chajja, Ananapuri and Schools at 35+00, 36+500, 58+00, Schools at Agarpura, Khodan Sujaji Ka Gada, Metwala. (Chainages of both habitations and schools are given in Section 15 of Schedule-A). Total no of samples=40  Batching and hot mix plants sampling part of SPCB annual renewal of permits Total No of Samples 2 times in each human habitations during construction period - One sample for HMP, One sample for Batching/RMC Concreate Mix Plan and one sample for WMM Plant in each	During Active Construction Phase	Air quality standard by CPCB	60x 9000=Rs.54 0000.00	EPC Contractor through approved monitoring agency	AE/PMC/RP WD-PIU- PPP

Env. Indicator	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervision /Monitoring
				quarter during construction period. Total No of sample-samples=20. Total numbers of samples during entire scheduled construction period =60					
				No of samples may increase for EOT period.					
	Operation stage			Toll Plaza-3 sample each quarter. Total 12 samples in a year. Human habitations, especially sensitive receptors. 6 samples in each quarter. Total no of 18 samples.	24 hr continuous, 3/year for 1 year of operation period (Total 3 times in a year Except Monsoon Season)	Air quality standard by CPCB	30X9000 =Rs 270000.00	EPC Contractor through approved monitoring agency	AE/PMC/R PWD-PIU- PPP
Water Quality	Constructio n stage	Ground water: (IS: 10500:2012) and Surface water criteria for freshwater classification	Grab sample collected from source and analyse as per Standard Methods for Examination of Water and Wastewater	Construction Camps	3/year till the end of construction activities (Total 3 times in a year baring monsoon), 6 bore well, 6 surface water sample in each quarter. Minimum 3 samples in each quarter. Total no 50 samples during entire scheduled construction		50x 5000 = Rs 250000.00	EPC Contractor through approved monitoring agency	AE/PMC/RP WD-PIU- PPP

Env. Indicator s	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervision /Monitoring
					period. No of samples may increase for EOT period.				
	Operation stage			Groundwater at 4 locations and surface water at 4 locations	3/year for 1 year	Water quality standard by CPCB	24x5000=Rs 120000.00	EPC Contractor through approved monitoring agency	AE/PMC/RP WD-PIU-PPP
Noise levels	Constructio n stage	Equivalent Noise levels on dB (A) scale for day and night	IS:4954-1968 as adopted by CPCB for Identified Study Area CPCB/IS:495 4-1968Using Noise level meter	Same as air quality Total numbers of samples during entire scheduled construction period. No of samples may increase for EOT period.	During Active Construction Phase	National Ambient Noise Standard specified in Environmen t Protection Act, 1986	60x1500=Rs .90000.00	EPC Contractor through approved monitoring agency	AE/PMC/RP WD-PIU- PPP
	Operation stage			Same as air quality	3/year for 1 year		30x1500=Rs .45000.00	EPC Contractor through approved monitoring agency	AE/PMC/R PWD-PIU- PPP
Soil Quality	Constructio n Stage	NPK (ICAR standard) and heavy metals	As specified by the site engineer RPWD / supervision consultant	Camp, Dumping/storage areas and HMP sites (Total 4 sample locations)	Once during entire construction stage	ICAR standards	4x3000=Rs. 12000.00	EPC Contractor through approved monitoring agency	AE/PMC/RP WD-PIU- PPP
	Operation stage	Oil and grease		At oil spillage locations and other probable soil contamination locations (Total 3 samples)	Once for the first year of operation	ICAR Standards	3x3000=Rs. 9000.00	EPC Contractor through approved monitoring agency	AE/PMC/R PWD-PIU- PPP

Env. Indicator s	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervision /Monitoring
Soil Erosion	Constructio n Stage	Visual check for Soil erosion and		Throughout the Project Corridor especially at River	After first rain	Visual Checks	Included in Engineering Cost	EPC Contractor	AE/PMC/R PWD-PIU- PPP
	Operation Stage	siltation		banks, bridge locations and river training structures	Once during operation of 1st year	Visual Checks	Routine Engineering Work	Engineering AE/PMC/RPWD	
Drainage Congestio n	Constructio n stage	Visual Checks		Throughout the Project Corridor especially Probable drainage congestion areas	Once in a year before rainy season	None Specific	Included in Engineering Cost	EPC Contractor	AE/PMC/RP WD-PIU- PPP
	Operation Stage				Once in a year before rainy season	None Specific	Routine Engineering Work	Engineering Tea AE/PMC/RPWD	-PPP
Borrow Areas- Prior obtaining of ECs for borrow areas is exempted by MoEFCC	Constructio n Stage	Visual Checks	IRC guidelines	Borrow areas to be operated	Once in a month	ADB and IRC guidelines	EPC Contractor	EPC Contractor with approval from AE/PIU- RPWD-PPP	AE/PMC/RP WD-PIU- PPP
	Operation Stage	Visual Checks	Rehabilitatio n as per IRC guidelines	Closed Borrow Areas	Quarterly for 1 year			EPC Contra approval from RPWD-PPP	
Constructi on Sites and Labor Camp	Constructio n stage	Visual Checks of Hygiene, drainage Medical Facilities Etc.	Rapid audit as per reporting format	Construction Sites and Camp	Quarterly during construction period	IRC guidelines	Part of the regular monitoring	EPC Contractor with approval from AE/RPWD-PIU-PPP	AE/PMC/RP WD-PIU- PPP
Tree Plantation	Constructio n Stage	Visual che Surveillance i trees felling	eck based monitoring of	Throughout the Project Section	During site clearance in construction phase	As suggested by Forest Dept.	Compensato ry: RPWD Additional Plantation: Provisional sum under Civil Cost	Compensatory: Forest Department Additional Implementation Contractor. Supplementation AE/PMC/RPWD	Plantation: by The EPC pervision and by

Env. Indicator s	Project Stage	Parameters	Method/ Guidelines	Location	Frequency and Duration	Standards	Approximat e cost (Rs)	Implementatio n	Supervision /Monitoring
	Operation stage	Audit for surviv plantation	al rate of trees	Throughout the Project Section	Quarterly during Defect Liablity Period			Defect Liability F particular stretch period RPV through	up to the Period in any h. After this VD-PIU-PPP PMC/EPC will be
Record of Accident	Constructio n Stage	accidents. Me suggested	and cause of ethodology as by IE/Safety d approved by		accidents	As suggested by PMC/IE/RP WD-PIU- PPP	Part of the regular monitoring	EPC Contractor	AE/PMC/RP WD-PIU- PPP
•	Operation stage			Throughout the stretch	occurrence of accidents	Same as above	Same as above	Road Safety u PIU-PPP, with local police, AE	support from

Monitoring Costs: INR 1236000.00 excluding other applicable charges including GST to be mentioned in Terms and Conditions of Contract Agreement signed between EPC Contractor and Outsourced Monitoring Laboratory.

EFP: Environmental Focal Person, RPWD: Rajasthan State Public Works Department, NPK: Nitrogen, Phosphorous and Potassium, PMC: Project Management Consultant, AE: Authority Engineer, IEE: Initial Environmental Examination, IRC: Indian Road Congress, DEIAA: District Environmental Impact Assessment Authority, SEIAA: State Environmental Impact Assessment Authority, CPCB: Central Pollution Control Board, IS: Indian Standard

## **Appendix H Noise Prediction Contours**

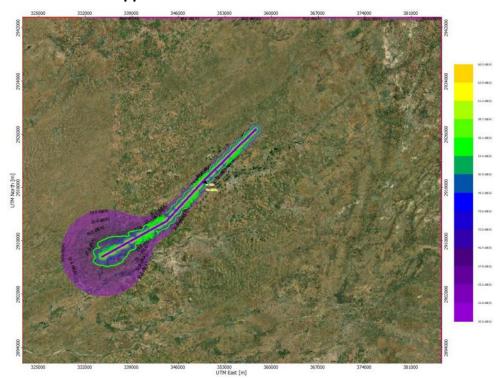


Figure 1: Noise Model Results- SH-21-Start Year

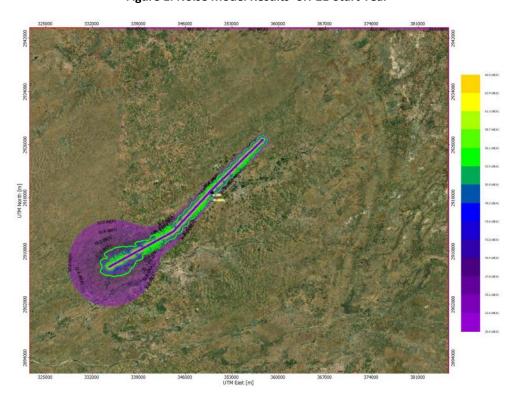


Figure 2: Noise Model Results- SH-21-2026

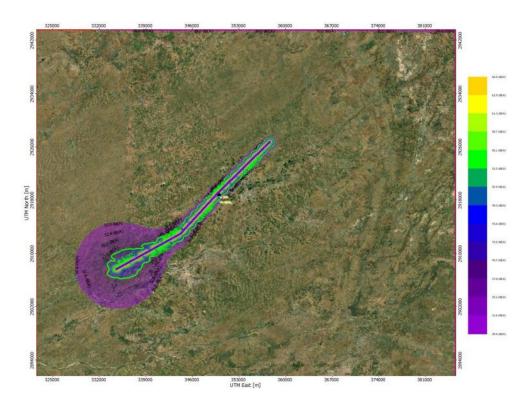


Figure 3: Noise Model Results- SH-21-2031

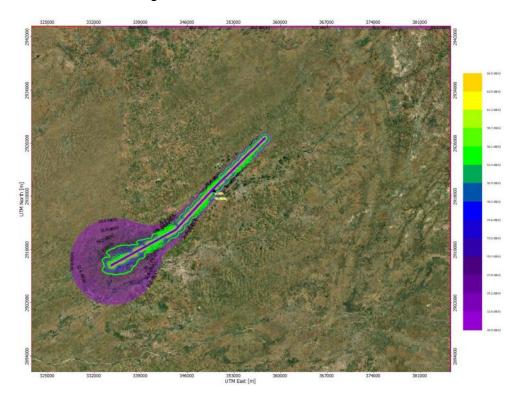


Figure 4: Noise Model Results- SH-21-2036

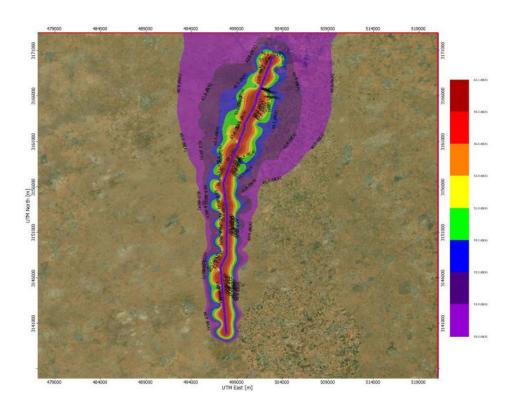


Figure 5: Noise Model Results- SH-36-Start Year

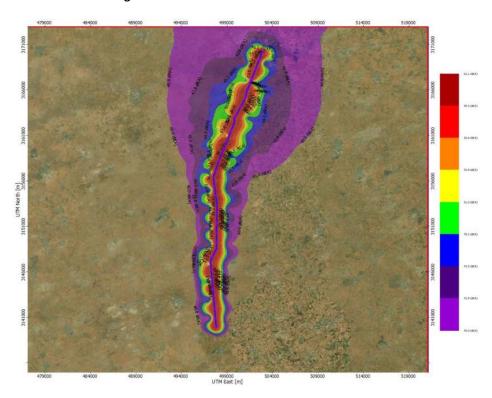


Figure 6: Noise Model Results- SH-36-2026

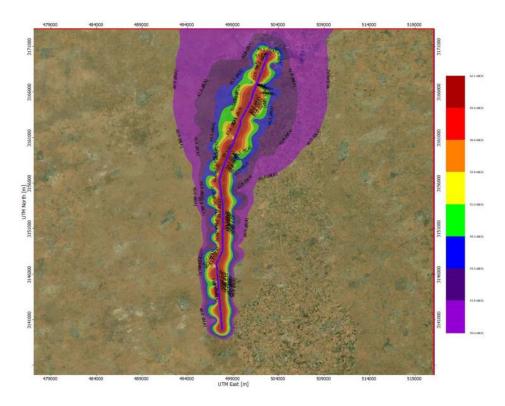


Figure 7: Noise Model Results- SH-36-2031

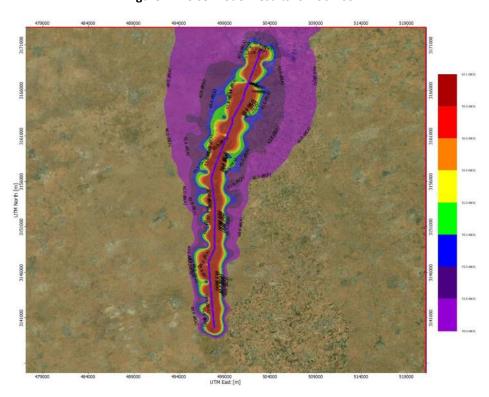


Figure 8: Noise Model Results- SH-36-2036

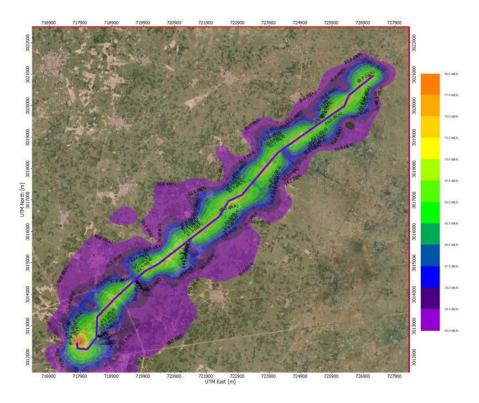


Figure 9: Noise Model Results- SH-44-Start Year

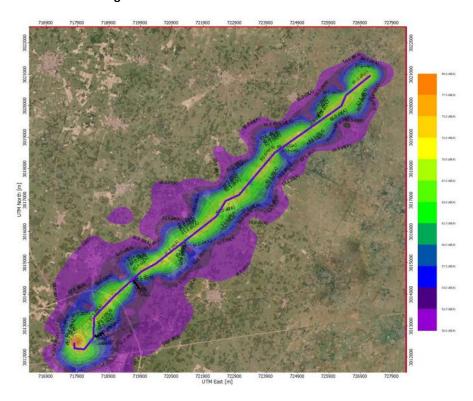


Figure 10: Noise Model Results- SH-44-2026

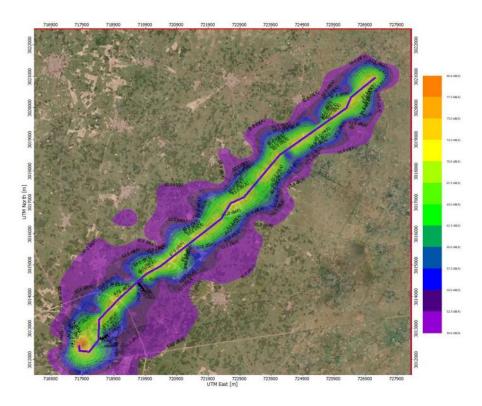


Figure 11: Noise Model Results- SH-44-2031

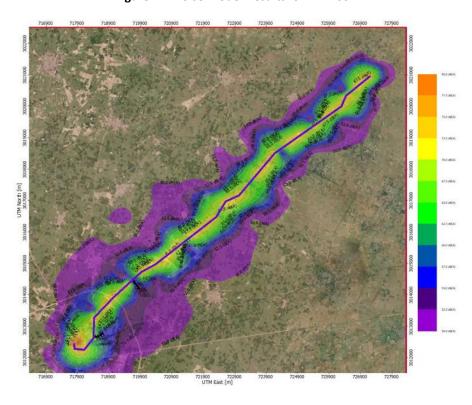


Figure 12: Noise Model Results- SH-44-2036

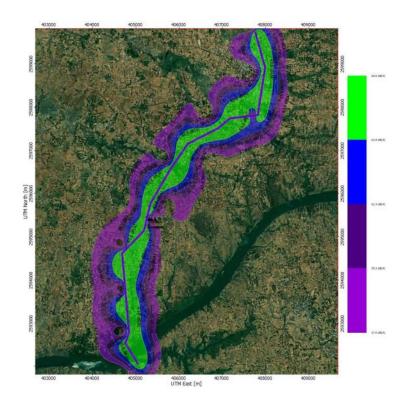


Figure 13: Noise Model Results- SH-10A-Start Year

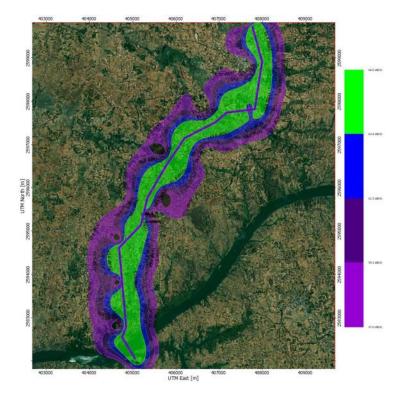


Figure 14: Noise Model Results- SH-10A -2026

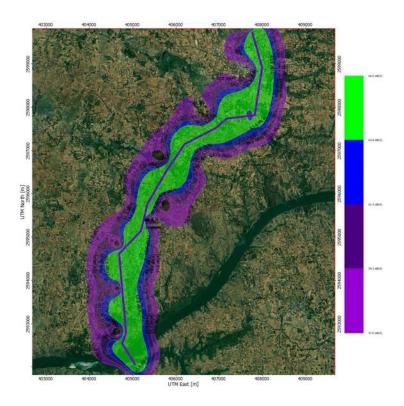


Figure 15: Noise Model Results- SH-10A -2031

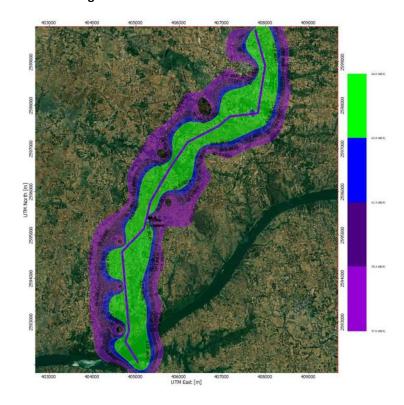


Figure 16: Noise Model Results- SH-10A -2036