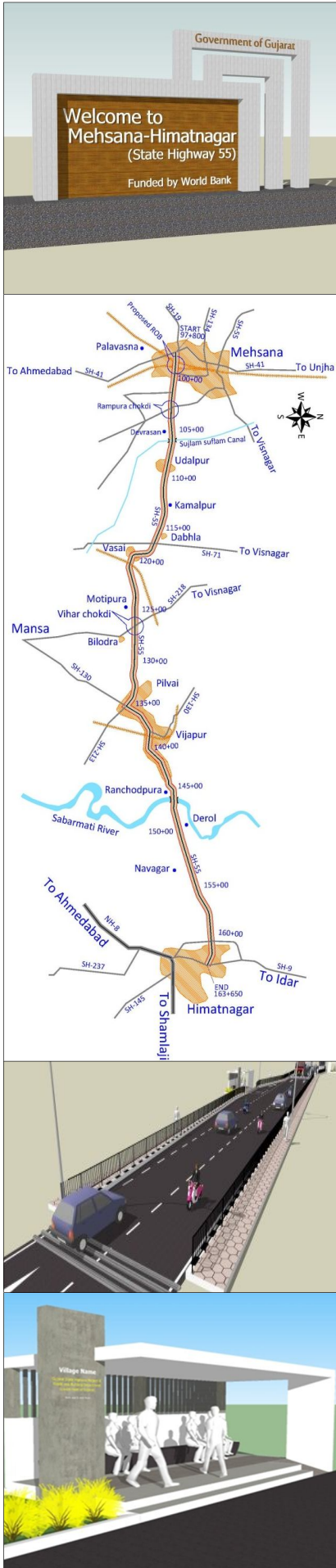


ROADS AND BUILDINGS DEPARTMENT
GOVERNMENT OF GUJARAT

**Project Preparatory Works Consultancy Services for
Gujarat State Highway Project - II**



**Volume-IV:
Environmental Management Plan (EMP)
(MEHSANA – HIMATNAGAR)**

May 2013

VOLUME-IV

ENVIRONMENT MANAGEMENT PLAN

CONTENTS

| | | |
|-----------|--|-----------|
| 1. | INTRODUCTION..... | 1 |
| 1.1 | BACKGROUND..... | 1 |
| 1.2 | CONTEXT FOR THE EMP | 1 |
| 1.3 | BRIEF DESCRIPTION OF THE PROJECT ROAD | 1 |
| 1.4 | CLEARANCE REQUIREMENTS | 2 |
| 1.5 | STRUCTURE OF THE REPORT..... | 4 |
| 2. | ENVIRONMENTAL ISSUES | 5 |
| 2.1 | SUMMARY OF IMPACTS..... | 5 |
| 2.2 | SPECIFIC MEASURES | 7 |
| 3. | PILOT GREEN HIGHWAYS INITIATIVE | 10 |
| 4. | ENVIRONMENTAL MANAGEMENT PLAN..... | 17 |
| 4.1 | PRE-CONSTRUCTION STAGE..... | 17 |
| 4.2 | CONSTRUCTION STAGE..... | 17 |
| 4.3 | OPERATION STAGE..... | 18 |
| 5. | IMPLEMENTATION ARRANGEMENTS | 33 |
| 5.1 | ENVIRONMENTAL MONITORING PLAN | 33 |
| 5.2 | REPORTING SYSTEM | 36 |
| 5.3 | NON CONFIRMITY TO EMP..... | 36 |
| 5.4 | INSTITUTIONAL SETUP | 38 |
| 5.5 | GOOD ENVIRONMENTAL CONSTRUCTION GUIDELINES | 39 |
| 6. | ENVIRONMENTAL MANAGEMENT BUDGET..... | 40 |

List of Tables

| | | |
|------------|---|----|
| Table 1.1: | List of GSHP-II DPR Corridors..... | 1 |
| Table 1.2: | Details of forest land diversion (NPF)..... | 3 |
| Table 1.3: | Applicable Laws and Regulations..... | 3 |
| Table 2.1: | Summary of Environmental Impacts and Design Measures | 5 |
| Table 2.2: | Environmental and Social Specific Measures..... | 7 |
| Table 3.1: | Selected Enhancement Measures for Proposed Project corridor..... | 11 |
| Table 3.2: | Solar Street Light Locations along the Green Highway | 11 |
| Table 3.3: | List of Trees-species wise (Girth size below 90cm)..... | 12 |
| Table 3.4: | Details of Goucher Land along the Project Corridor..... | 13 |
| Table 3.5: | Details of Cattle Crossing Locations along the Project Corridor | 14 |
| Table 4.1: | Environmental Management Plan | 19 |
| Table 5.1: | Environmental Monitoring Indicators | 33 |
| Table 5.2: | Environmental Monitoring Plan..... | 35 |
| Table 5.3: | Summary details of Reporting | 36 |
| Table 5.4: | Institutional Responsibilities..... | 38 |
| Table 5.5: | Guideline for Good Environmental Practices | 39 |
| Table 6.1: | Budgetary Provisions for Environmental Management Measures | 40 |

List of Figures

| | | |
|-------------|--|----|
| Figure 1.1: | Mehsana-Himatnagar Corridor key Map (SH-55) | 2 |
| Figure 2.1: | Intersection design at Rampura | 6 |
| Figure 3.1: | Few Snap shots of trees suitable for tree transplantation..... | 12 |

Figure 3.2: A landscaping section from 161+400 to 163+350 15

List of Appendices

- Appendix 1: MoEF EIA Notification amended -2011
- Appendix 2: NPF Clearance Mehsana-Himatnagar
- Appendix 3: Enhancement measures
- Appendix 4: Environmental Reporting System
- Appendix 5: Environmental Monitoring Location
- Appendix 6: Guidelines for Environmental Management
- Appendix 7: Bill of Quantities (BoQ)

List of Abbreviations

| | |
|-----------------|---|
| BOQ | Bill of Quantity |
| EIA | Environmental Impact Assessment |
| EMP | Environmental Management Plan |
| CoI | Corridor of Impact |
| CO | Carbon monoxide |
| CPR's | Common Property Resources |
| GPCB | Gujarat Pollution Control Board |
| GSHP-II | Gujarat State Highways Project – II |
| GoG | Government of Gujarat |
| IE | Independent Engineer |
| LASA | LEA Associates South Asia Pvt. Ltd. |
| LHS | Left Hand Side |
| MoRTH | Ministry of Road Transport and Highways |
| NOC | No Objection Certificate |
| NO _x | Nitrates of Oxygen |
| NH ₃ | Ammonia |
| NGO | Non-Government Organization |
| PIU | Project Implementation Unit |
| Pb | Lead |
| O ₃ | Ozone |
| R&BD | Roads and Buildings Department |
| RPF | Resettlement Policy Framework |
| RoW | Right of Way |
| RAP | Resettlement Action Plan |
| RPM | Respiratory Particle Matter |
| RHS | Right Hand Side |
| SO ₂ | Sulfur di oxide |
| SPM | Suspended Particle Matter |

1. INTRODUCTION

1.1 BACKGROUND

1. The Roads and Buildings Department (R&BD), Government of Gujarat (GoG) has taken up the preparation of the second Gujarat State Highway Project (GSHP-II), covering up-gradation, maintenance and improvement of identified core road network for loan appraisal with the World Bank. Towards project preparation, R&BD has retained M/s LEA Associates South Asia Pvt. Ltd. (LASA) as Project Preparatory Works Consultants to prepare plans for the widening and up gradation of highways as well as for carrying out the assessment of environmental and social impacts. As a pre-requisite for loan appraisal, the World Bank, R&BD-GoG has selected nine corridors at this stage, for preparation of detailed designs. The details of the selected corridors are given in Table 1.1.

Table 1.1: List of GSHP-II DPR Corridors

| Sl. No. | Work Type | Link Name | Corridor No | Length km |
|---------|---------------------------------|--|----------------|--------------|
| 1. | Two Laning / Wide Two Laning | Dabhoi – Bodeli | SH-11 | 38.60 |
| 2. | | Dhanduka – Dholera | SH-20 | 27.00 |
| 3. | | Atkot-Gondal | SH-01 | 35.55 |
| 4. | Four laning | Mehsana – Himatnagar | SH-55 | 66.15 |
| 5. | Two Laning / Wide Two Laning | Umreth- Vasad (including Kapdavanj-Ladvel) | SH-83,SH-188 | 35.45 |
| 6. | | Bayad – Lunawada | SH-69,SH-63 | 44.56 |
| 7. | | Dhansura – Meghraj | SH-145, SH-146 | 46.65 |
| 8. | Rehabilitation/ maintenance | Lunawada – Khedapa | SH-02, SH-152 | 56.70 |
| 9. | | Paliyad-Dhanduka | SH-01 | 46.00 |

Source: R&BD

1.2 CONTEXT FOR THE EMP

2. As part of the project preparation, an Environmental Impact Assessment (EIA) has been undertaken for the proposed roads. This EMP for the Mehsana-Himatnagar (SH-55) corridor is based on the findings of EIA. It also details the effective implementation of the environmental management measures required for addressing the potential environmental impacts in the project. This Environmental Management Plan assists the project proponent, Independent Engineer and the Concessionaire to implement the environmental management measures suggested as an outcome of the EIA.

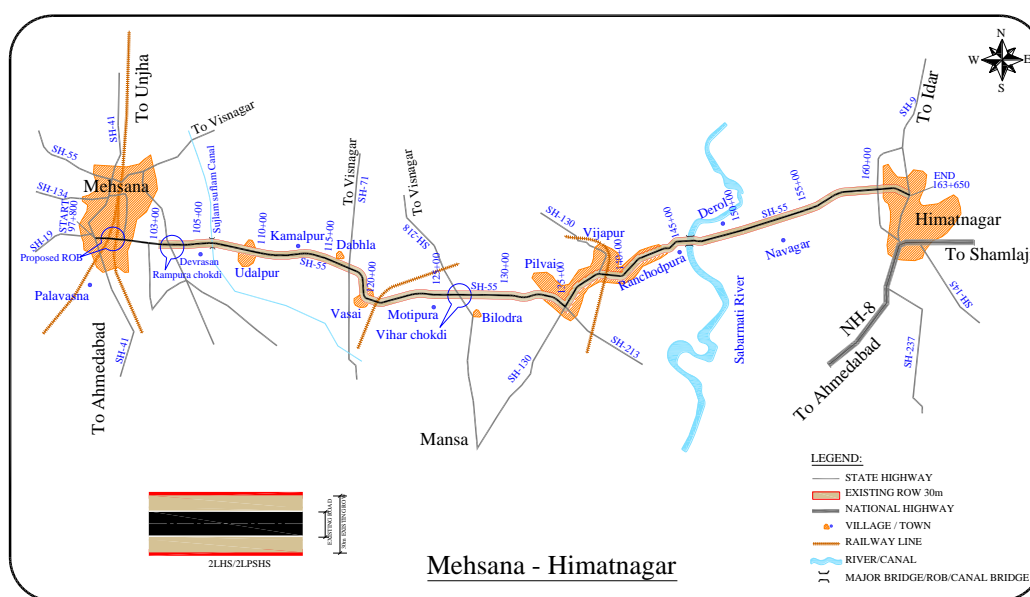
1.3 BRIEF DESCRIPTION OF THE PROJECT ROAD

3. The project corridor starts near Rampura Chokdi at Ch103+000 on SH-55 and ends at Ch163+650. The total length of the corridor is 60.65km (based on the existing chainage) (Figure 1.1). The project corridor traverses through plain terrain and it is characterized by clayey soil mixed with silt and sand.

4. The project corridor passes through Mehsana, Visnagar and Vijapur talukas of Mehsana district, Mansa taluka of Gandhinagar district and Himatnagar taluka of Sabarkanta district, and thus comprising of 26 villages and one town (Vijapur). Settlements along the corridor are Rampura (Ch103+200), Udapur (Ch109+000), Dabhala (Ch115+500), Vasai (Ch119+000), Vihar Chowkdi (Ch127+000), Pilvai (Ch134+000), Vijapur (Ch139+000), Ranchodpur (Ch144+000) and Himatnagar (Ch161+000).

5. The project corridor comprises SH-55, starting at km 103+000 near RampuraChokdi and ending at Himatnagar. The corridor is having a carriageway of 10m wide with exception of km 127 to km 135 which is having 7.0m width. The available RoW is 30 m and the current pavement status is in fair condition. The proposed road configuration is four lane with hard shoulder and from Ch138+400 to Ch141+000, it is decided to have 6 lane with closed drain with foot path.

6. Some of the green highway Initiatives, which had been adopted internationally, is being introduced as a pilot study in this project corridor. Based on the observations, a stretch from Vijapur (Ch 140+000) to Himatnagar (Ch163+000) has been chosen for the implementation of these green highways concepts. The green highway Initiative includes Tree transplantation, Use of renewable energy (Solar), Pavement recycling, Use of warm mix asphalt, Cattle crossing, landscaping and Solid waste management.



1.4 CLEARANCE REQUIREMENTS

7. **Environmental Clearance:** As per the amendment dated 4th April, 2011 of EIA notification 2006, environmental clearance has been made mandatory only for new state highways (refer **Appendix -1**). Hence, the widening / strengthening and improvement works on existing State Highways are not covered under the ambit of the notification and are not categorized either as Category A or Category B. However, the project shall require obtaining consent from competent authorities such as the Gujarat Pollution Control Board (GPCB), for the purpose of '**Consent to Establish**' by submitting an online Common Application (as per Schedule-I), under Water (Prevention and Control of Pollution) Act, 1974, Air (Prevention and Control of Pollution) Act, 1981) and authorization under Hazardous Wastes (Management and Handling) Rules, 1989, as amended.

8. **Forest Clearance:** The project corridor traverses through three districts namely Mehsana (Ch 97+800 to 127+000 and Ch 135+200 to 147+225), Gandhinagar (Ch 127+000 to 135+200) and Sabarkanta (Ch 147+225 to 163+750). Since the project calls for diversion of

forest land for non-forest purpose, the project corridor has to be split into three stretches, based on the jurisdiction limit. Accordingly the forest clearance procedure as stipulated in the Forest Act, 1980 is adopted. Forest Clearance Proposal (Form-A) had been prepared and submitted along with the necessary enclosures to the District Forest Officer (DFO), Social Forestry Division through State Road Project (SRP) Division, Rajkot for further action.

9. As per the Gujarat Government Gazette dated 5th July, 1973 and 3rd July 1975, Mehsana-Visnagar-Vijapur-Himatnagar (SH-55) corridor is declared as 'Notified Protected Forest (NPF)' under Forest (conservation) Act 1980. As per the directions of the forest department, the corridors which had been declared as State Highways before 1980 will have 9.75m width (Black top and shoulder) as road way width and corridors that are declared after 1980 as State Highways will have the actual (existing) width of the black top and shoulder as road way width. Adopting this criterion, the project corridor (SH-55) has been designated as State Highways (SH -55) before the year 1980, hence a width of 9.75m is considered for applying forest clearance based on the forest department directions. Any requirement beyond this necessitates the submission of forest land diversion proposal.

10. The stretches of the project corridor falling in the Gandhinagar (Ch 127+000 to 135+200) and Sabarkanta (Ch 147+225 to 163+750) had already obtained forest clearance (refer Appendix -2) for the purpose of diversion of 15m and 18m of the forest land respectively for road widening purposes. Hence, for the proposed improvement (strengthening and widening within 26m CoI), the forest land diversion has been calculated by deducting the area which has already obtained clearance from the forest department. The details of the forest land diversion for the project corridor are shown in the following Table 1.2.

Table 1.2: Details of forest land diversion (NPF)

| Sl.No. | Project corridor - sections | District Jurisdiction | Length (km) | Width considered as road way width (m) | Area to be diverted (ha) |
|--------|---|-----------------------|-------------|--|--------------------------|
| 1 | Km 97+740 to 127+000 and 135+200 to 147+225 | Mehsana | 41.285 | 9.75 | 72.69 |
| 2 | Km 127+000 to 135+200 | Gandhinagar | 8.200 | 15.00 | 9.09 |
| 3 | Km 147+225 to 163+750 | Sabarkanta | 16.525 | 18.00 | 14.33 |

11. **Other Project Clearances:** Implementation of the project works would require clearances from the Gujarat Pollution Control Board (GPCB) as well as several other line agencies. These would have to be obtained by the Concessionaire before commencement of civil works in the project area. The clearances to be obtained are presented in Table 1.3.

Table 1.3: Applicable Laws and Regulations

| Sl. No. | Clearances | Acts | Approving Agency | Applicability to the Project | Indicative Time Frame | Responsibility | |
|----------------------------------|--------------------------------|--|---------------------------------|------------------------------|-----------------------|----------------|-------------|
| | | | | | | Execution | Supervision |
| PROJECT PREPARATION STAGE | | | | | | | |
| 1 | No Objection Certificate (NOC) | Water (Prevention and Control of Pollution) Act 1974, Air (Prevention and Control of Pollution) Act 1981 | Gujarat Pollution Control Board | Applicable | 3-6 months | PIU | - |

¹ The right of permission vests with the Competent Authority

| Sl. No. | Clearances | Acts | Approving Agency | Applicability to the Project | Indicative Time Frame | Responsibility | |
|-------------------------------------|--|---|--|--|----------------------------------|----------------|----------------------|
| | | | | | | Execution | Supervision |
| 2 | Diversion of forest land for Non-forest use | Forest Conservation Act (1980) Forest Conservation Rules (2003) and Guidelines issued to date | Regional Office Western Zone, MoEF, Bhopal | Applicable | 9-12 months | PIU | - |
| 3 | Permission for removal of avenue tree within the PROW | Forest Conservation Act (1980) Forest Conservation Rules (2003) and Guidelines issued to date | Forest Department, GoG | Applicable | 3 -6 month for each workout area | PIU | - |
| PROJECT IMPLEMENTATION STAGE | | | | | | | |
| 4 | Permission for Withdrawal of Surface Water from Rivers, Nala, Water harvesting structure/ Reservoirs/ Ponds/ Irrigation canals | Gujarat Water Supply and Sewerage Board Act, 1978 | Gujarat Water Supply and Sewerage Board | Applicable (If the Concessionaire is extracting surface water) | 3 months | Concessionaire | Independent Engineer |
| 5 | Permission for Sand Mining from river bed | Mines and Minerals (Development and Regulation) Act, 1957 | Commissioner of geology and mining, GoG | Applicable | 2 month | Concessionaire | Independent Engineer |
| 6 | Permission for Opening of New Quarry | Mines and Minerals (Development and Regulation) Act, 1957 | Commissioner of geology and mining, GoG | Applicable | 2 month | Concessionaire | Independent Engineer |
| 7 | Hot mix plant, Crushers, Cement Batching Plant | Air (Prevention and Control of Pollution) Act. 1981 | Gujarat Pollution Control Board | Applicable | 3 months | Concessionaire | Independent Engineer |
| 8 | Storage of Hazardous Chemicals | Hazardous Waste (Management and Handling) Rules 1989 and Manufacturing Storage and Import of Hazardous Chemicals Rules 1989 | Gujarat Pollution Control Board | Applicable | 3 months | Concessionaire | Independent Engineer |
| 9 | Disposal of Hazardous Waste | Hazardous Waste (Management and Handling) Rules 1989 | Gujarat Pollution Control Board | Applicable | 2 months | Concessionaire | Independent Engineer |
| 10 | Disposal of Construction Waste & liquid effluent from Labour camps | Water (Prevention and Control of Pollution) Act 1974 | Gujarat Pollution Control Board | Applicable | 2 months | Concessionaire | Independent Engineer |
| 11 | Pollution Under Control Certificate | Central Motor Vehicles Act 1988 | Transport Department (GoG) | Applicable | 1 Month | Concessionaire | Independent Engineer |
| 12 | Employing Labour | Executing Agency of Building and other construction act, 1996 | Labour & Employment Department, GoG | Applicable | 1 Week | Concessionaire | Independent Engineer |
| 13 | Registration of Workers | Labour welfare Acts. | Labour & Employment Department, GoG | Applicable | 1 Month | Concessionaire | Independent Engineer |

Source: Acts, Rules and Regulation from Central and State Government

1.5 STRUCTURE OF THE REPORT

12. This report is structured to be a standalone document suitable for handing over to the Concessionaire for enabling him to implement the suggested environmental management measures which has resulted due to EIA. Further to the introduction, this chapter also provides a summary of the environmental impacts and the necessary mitigation measures as detailed in Chapter 2. Pilot Green Highways Initiatives (Environmental friendly highway interventions) proposed for this project corridor is discussed in the chapter 3. Environmental Management Plan is presented in Chapter 4, while the implementation arrangements for implementing the EMP are presented in the Chapter 5. Chapter 6 provides the necessary budget for implementing the EMP.

2. ENVIRONMENTAL ISSUES

2.1 SUMMARY OF IMPACTS

13. Environmental Impact Assessment has been carried out for the project corridor and the impacts that are likely to arise from the implementation of the projects are detailed along with suitable design measures in the Table 2.1.

Table 2.1: Summary of Environmental Impacts and Design Measures

| Sl.No | Environmental and Social Impact | Design Measures |
|-------|--|--|
| 1. | A total of 14,905 trees ² (encompassing all the three districts along the corridor) are being impacted. | By adopting the CoI approach and prevention of felling of trees along the natural drains in rural sections, have resulted in the conservation of nearly 2165 trees. As a management measure compensatory afforestation, as directed by the forest department shall be carried out. |
| 2. | Forest land diversion: 143.0ha of protected forest land needs to be diverted for widening and strengthening activity by adopting standard cross section. | By adopting CoI approach, the initial estimation of 143.0ha of protected forest land diversion has been reduced to 96.11ha. As a compensatory measure, the conditions for the diversion of forest land laid by the forest department shall be carried out. |
| 3. | Impact on water bodies (surface and ground water) <ul style="list-style-type: none"> • Ponds: Ch 118+200, 123+200, 133+025 and 144+500 • River/Canal crossings: <ul style="list-style-type: none"> • Major: Ch 146+525 (Sabarmati river) • Minor: SujalamSuphalam canal at Ch.106+400 and 106+425 | Shifting of alignment has been adopted to prevent impact on ponds that are located within the RoW. However, at the river and canal crossings, the impact on the water quality is inevitable during construction. Hence, mitigation measures like provision of Silt traps and Oil interceptors are suggested at the locations where surface water (rivers/canals/drains) bodies are prevalent. |
| 4. | Road accident to the livestock while crossing the project corridor. | Major cattle crossing locations are identified at Rampura village near Bheemnath Temple (Ch 102+300, 102+800), Deverasan village (Ch 105+330, 105+580, 105+950), Udalpur (Ch 108+000 to 110+000), Vasai village near Shiv Temple (Ch 119+700), Bilodra village (Ch 129+600), Pilvai village (Ch 134+300) and Derol Village (Ch 147+100, 148+700, 149+900, 150+020, 151+100, 152+200). Cautionary signs provided at 120m prior to the cattle crossing location as per IRC norms. The irregular movement of the cattle along the project corridor shall be restricted by creating awareness/ capacity building among the villagers, guiding them to use the dedicated cattle crossings. These activities shall be initiated by a dedicated facilitating agency that needs to be hired for implementing this green Initiative for this project corridor |
| 5. | Impact on cultural Assets: There are 11 cultural and community assets (6 temples, 4 shrines and a mosque) are being fully impacted. | By adopting design modifications (CoI approach and shifting of alignment), the impact on 11 structures are reduced to 4 structures that are fully impacted (1 temple and 3 shrines) and 7 structures (5 temples, 1 shrine and a mosque) that are partially impacted. |
| 6. | Safety issues need to be addressed in the proposed design | <ul style="list-style-type: none"> • Road safety audit had been performed for the corridor and the outcome of the report and the public consultation has been taken as a base to provide road safety measures in the design. The safety measures include provision of safety measures near settlements, Junction improvements, street lights etc. Due care has been taken at the social sensitive locations like schools and temples. • Road design has been done as suggested by the local communities. Illustration of the design is depicted in the following Figure 2.1. |

²Estimated by Forest Department, GoG

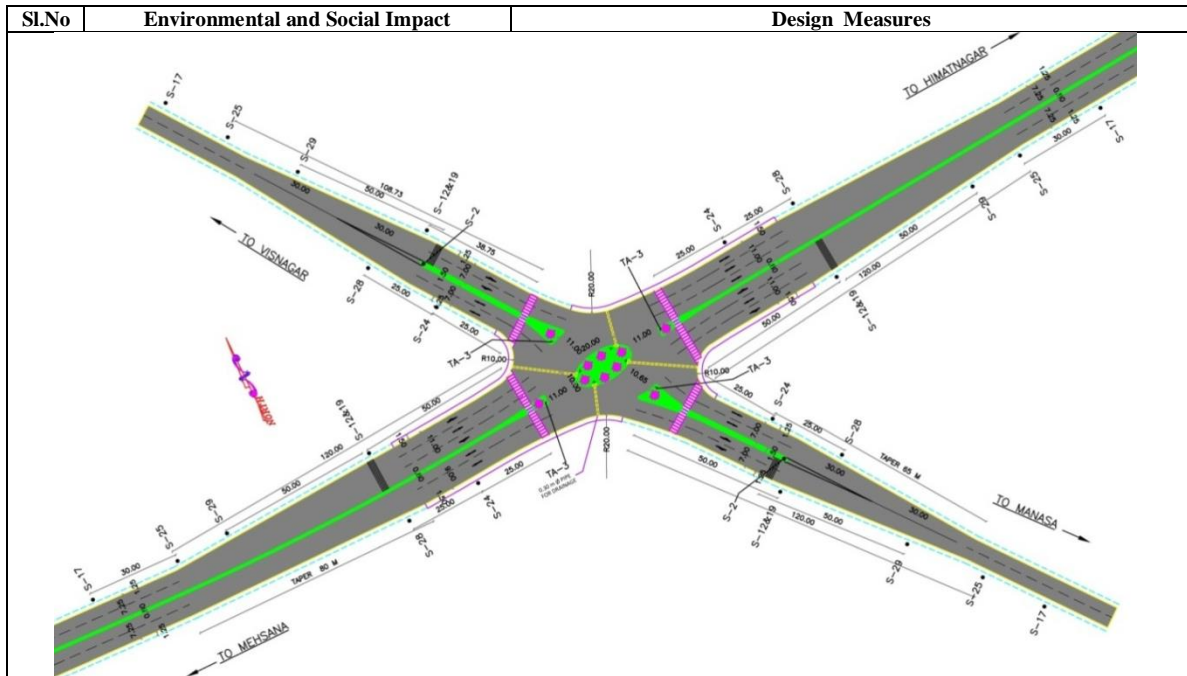


Figure 2.1: Intersection design at Rampura

| 7. | Pedestrian Safety | <ul style="list-style-type: none"> To reduce the speed and subsequently to increase the pedestrian safety, rumble strips and raised pedestrian crossings are proposed at major intersections / junctions and at entry & exit of settlements. The locations and chainage of Rumble strips are at: <table border="1" data-bbox="740 987 1407 2040"> <thead> <tr> <th>LHS</th> <th>RHS</th> </tr> </thead> <tbody> <tr><td>Rampura Junction:103+115</td><td>Rampura Junction:103+460</td></tr> <tr><td>Devrasan:105+275</td><td>Gunjada:107+765</td></tr> <tr><td>Gunjada:107+600</td><td>Udalpur:109+490</td></tr> <tr><td>Udalpur:109+135</td><td>Kamalpur:112+345</td></tr> <tr><td>Kamalpur:112+070</td><td>Dabhala:115+980</td></tr> <tr><td>Dabhala:115+475</td><td>Vasai:119+345,120+030</td></tr> <tr><td>Dabhala:115+800</td><td>Motipura:123+355,123+775</td></tr> <tr><td>Vasai:119+265,119+805</td><td>Titodan:124+460</td></tr> <tr><td>Motipura:123+255,123+550</td><td>Vihar Junction:127+230</td></tr> <tr><td>Titodan:124+275</td><td>Chadasana:130+955</td></tr> <tr><td>Vihar Junction:126+770,127+130</td><td>Fulwadi:134+400</td></tr> <tr><td>Chadasana:130+775</td><td>Pilwai School:134+725,135+680</td></tr> <tr><td>Fulwadi:134+215</td><td>Kamala Sankar School:135+955</td></tr> <tr><td>Pilwai School:134+650</td><td>Kotadi:136+825</td></tr> <tr><td>Pilwai:135+585</td><td>Khanusa:137+410,138+460</td></tr> <tr><td>Kamala Sankar School:135+885</td><td>Vijapur:139+015</td></tr> <tr><td>Kotadi:136+705</td><td>Govindpura:141+175</td></tr> <tr><td>Khanusa:137+295,138+375</td><td>Ranchodpura:144+305</td></tr> <tr><td>Vijapur:138+900</td><td>Sabarmati Bridge:147+630</td></tr> <tr><td>Govindpura:141+075</td><td>Ramgadh:148+690</td></tr> <tr><td>Ranchodpura:144+160</td><td>Derol:149+850</td></tr> <tr><td>Sabarmati Bridge:145+870</td><td>Nava Nagar:153+360</td></tr> <tr><td>Ramgadh:148+610</td><td>Dedharota:154+640</td></tr> <tr><td>Derol:149+720</td><td>Navalpur:156+500</td></tr> <tr><td>Navanagar:153+185</td><td>Satnagar:157+375</td></tr> <tr><td>Dedharota:154+455</td><td>Lalpur:159+010</td></tr> <tr><td>Navalpur:156+315</td><td>PTC College:161+630</td></tr> <tr><td>Satnagar:157+195</td><td>Panpur:162+130</td></tr> <tr><td>Lalpur:158+825</td><td>BCA College:162+585</td></tr> <tr><td>Polajpur:160+360</td><td>Kendriya Vidhayalay:162+930</td></tr> <tr><td>Himatnagar:161+130</td><td>Himatnagar:162+280,163+440,163+620</td></tr> <tr><td>PTC College:161+550</td><td></td></tr> <tr><td>Panpur:162+050</td><td></td></tr> <tr><td>BCA College:162+515</td><td></td></tr> <tr><td>Kendriya Vidhayalay:162+825</td><td></td></tr> <tr><td>Himatnagar:163+210,163+530</td><td></td></tr> </tbody> </table> <p>The locations and chainage of raised pedestrian crossings are at:</p> | LHS | RHS | Rampura Junction:103+115 | Rampura Junction:103+460 | Devrasan:105+275 | Gunjada:107+765 | Gunjada:107+600 | Udalpur:109+490 | Udalpur:109+135 | Kamalpur:112+345 | Kamalpur:112+070 | Dabhala:115+980 | Dabhala:115+475 | Vasai:119+345,120+030 | Dabhala:115+800 | Motipura:123+355,123+775 | Vasai:119+265,119+805 | Titodan:124+460 | Motipura:123+255,123+550 | Vihar Junction:127+230 | Titodan:124+275 | Chadasana:130+955 | Vihar Junction:126+770,127+130 | Fulwadi:134+400 | Chadasana:130+775 | Pilwai School:134+725,135+680 | Fulwadi:134+215 | Kamala Sankar School:135+955 | Pilwai School:134+650 | Kotadi:136+825 | Pilwai:135+585 | Khanusa:137+410,138+460 | Kamala Sankar School:135+885 | Vijapur:139+015 | Kotadi:136+705 | Govindpura:141+175 | Khanusa:137+295,138+375 | Ranchodpura:144+305 | Vijapur:138+900 | Sabarmati Bridge:147+630 | Govindpura:141+075 | Ramgadh:148+690 | Ranchodpura:144+160 | Derol:149+850 | Sabarmati Bridge:145+870 | Nava Nagar:153+360 | Ramgadh:148+610 | Dedharota:154+640 | Derol:149+720 | Navalpur:156+500 | Navanagar:153+185 | Satnagar:157+375 | Dedharota:154+455 | Lalpur:159+010 | Navalpur:156+315 | PTC College:161+630 | Satnagar:157+195 | Panpur:162+130 | Lalpur:158+825 | BCA College:162+585 | Polajpur:160+360 | Kendriya Vidhayalay:162+930 | Himatnagar:161+130 | Himatnagar:162+280,163+440,163+620 | PTC College:161+550 | | Panpur:162+050 | | BCA College:162+515 | | Kendriya Vidhayalay:162+825 | | Himatnagar:163+210,163+530 | |
|--------------------------------|------------------------------------|--|-----|-----|--------------------------|--------------------------|------------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|-----------------|-----------------|-----------------------|-----------------|--------------------------|-----------------------|-----------------|--------------------------|------------------------|-----------------|-------------------|--------------------------------|-----------------|-------------------|-------------------------------|-----------------|------------------------------|-----------------------|----------------|----------------|-------------------------|------------------------------|-----------------|----------------|--------------------|-------------------------|---------------------|-----------------|--------------------------|--------------------|-----------------|---------------------|---------------|--------------------------|--------------------|-----------------|-------------------|---------------|------------------|-------------------|------------------|-------------------|----------------|------------------|---------------------|------------------|----------------|----------------|---------------------|------------------|-----------------------------|--------------------|------------------------------------|---------------------|--|----------------|--|---------------------|--|-----------------------------|--|----------------------------|--|
| LHS | RHS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rampura Junction:103+115 | Rampura Junction:103+460 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Devrasan:105+275 | Gunjada:107+765 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Gunjada:107+600 | Udalpur:109+490 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Udalpur:109+135 | Kamalpur:112+345 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kamalpur:112+070 | Dabhala:115+980 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dabhala:115+475 | Vasai:119+345,120+030 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dabhala:115+800 | Motipura:123+355,123+775 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vasai:119+265,119+805 | Titodan:124+460 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Motipura:123+255,123+550 | Vihar Junction:127+230 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Titodan:124+275 | Chadasana:130+955 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vihar Junction:126+770,127+130 | Fulwadi:134+400 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Chadasana:130+775 | Pilwai School:134+725,135+680 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fulwadi:134+215 | Kamala Sankar School:135+955 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pilwai School:134+650 | Kotadi:136+825 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pilwai:135+585 | Khanusa:137+410,138+460 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kamala Sankar School:135+885 | Vijapur:139+015 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kotadi:136+705 | Govindpura:141+175 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Khanusa:137+295,138+375 | Ranchodpura:144+305 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vijapur:138+900 | Sabarmati Bridge:147+630 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Govindpura:141+075 | Ramgadh:148+690 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ranchodpura:144+160 | Derol:149+850 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sabarmati Bridge:145+870 | Nava Nagar:153+360 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ramgadh:148+610 | Dedharota:154+640 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Derol:149+720 | Navalpur:156+500 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Navanagar:153+185 | Satnagar:157+375 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dedharota:154+455 | Lalpur:159+010 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Navalpur:156+315 | PTC College:161+630 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Satnagar:157+195 | Panpur:162+130 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Lalpur:158+825 | BCA College:162+585 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Polajpur:160+360 | Kendriya Vidhayalay:162+930 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Himatnagar:161+130 | Himatnagar:162+280,163+440,163+620 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PTC College:161+550 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Panpur:162+050 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BCA College:162+515 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kendriya Vidhayalay:162+825 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Himatnagar:163+210,163+530 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Sl.No | Environmental and Social Impact | Design Measures |
|-------|---------------------------------|------------------------------------|
| | | Raised Pedestrian crossings |
| | | Devasan:105+410 |
| | | Udalpur:109+265 |
| | | Kamalpur:112+210 |
| | | Chanakya Vidhya Mandir:127+180 |
| | | Pilvai School:134+680 |
| | | Kamala Sanskar School:135+925 |
| | | Vijapur:139+200 |
| | | PTC College:161+580 |
| | | BCA College:162+550 |
| | | Kendriya Vidhayalay:162+875 |
| | | Himatnagar:163+415, 163+595 |
| | | Zebra Crossing |
| | | • Gunjada:107+630,107+735 |
| | | • Dabhala:115+825,115+945 |
| | | • Vasai:119+290,119+855 |
| | | • Motipura:123+290,123+585,123+735 |
| | | • Titodan:124+315,124+420 |
| | | • Vihar Junction:126+810 |
| | | • Pilodara:128+545,128+630 |
| | | • Chadasana:130+815,130+915 |
| | | • Fulwadi:134+250,134+360 |
| | | • Pilwai:135+630 |
| | | • Kotadi:136+740 |
| | | • Khanusa:137+365,138+440 |
| | | • Vijapur:138+925,140+450 |
| | | • Govindpura:141+105 |
| | | • Nava Devpura:143+645,143+770 |
| | | • Ranchodpura:144+200 |
| | | • Saroli:148+910,149+010 |
| | | • Derol:149+815 |
| | | • Krishnanagar:150+440,150+550 |
| | | • Nava Nagar:153+220,153+330 |
| | | • Dedharota:154+490,154+600 |
| | | • Navalpur:156+350,156+460 |
| | | • Satnagar:157+230,157+340 |
| | | • Lalpur:158+860,158+980 |
| | | • Polajpur:160+400,160+505 |
| | | • Polajpur:160+400,160+505 |
| | | • Polajpur:160+400,160+505 |
| | | • Polajpur:160+400,160+505 |
| | | • Polajpur:160+400,160+505 |
| | | • Polajpur:160+400,160+505 |

2.2 SPECIFIC MEASURES

14. Some of the project related impact cannot be resolved through design modifications/ alterations, for those impacts specific mitigation measures are suggested as discussed in the Table 2.2. Some of the suggested measures are also taken as an input based on the public consultation held along the corridor.

Table 2.2: Environmental and Social Specific Measures

| Sl.No | Impact | Mitigation Measures |
|-------|---|--|
| 1. | Impact on residential/ commercial structures and land acquisition Issues | (i) 26m CoI approach has been adopted for minimising the social impacts associated with the residential/ commercial and land acquisition issues. (ii) For instances where unavoidable impact on land and structures are anticipated, compensation and assistance will be provided in line with the Resettlement Policy Framework (RPF) adopted for the project. |
| 2. | Upgradation of the existing drains (bridges and culverts) | All the bridges, culverts and irrigation canals that are existing are proposed to be upgraded. The flood data collected from the irrigation department is used as a source for designing the drain provisions. Additional drain facility is also suggested at locations where water logging problem prevails. |
| 3. | 516 avenue trees having girth size between 30 to 90cm are being impacted in the green | The identified trees are proposed to be transplanted with the help of tree transplanting machines owned by Forest Department, GoG. Land |

| Sl.No | Impact | Mitigation Measures |
|-------|--|--|
| | highway stretch (Vijapur to Himatnagar section), which are capable of surviving, if it is transplanted to other locations. | suitable for survival (preferably Goucher land/ revenue land and available spaces in Government office (R&BD) and Government Schools) has been identified along the corridor and the cost for transplantation had been worked and included as an item in the environmental management budget. |
| 4. | Poor management/ Littering of solid waste in the green highways stretch | Solid waste management is planned to implement through a facilitating agency by conducting capacity building/ awareness to the public, provision of dust bins at locations (Ch139+500, 144+200, 161+100, 163+100 and 163+600) identified as potential area for proper SWM practices. |
| 5. | Impact on local land use (topography/ Soil) due to the disposal of the construction waste generated during the project construction | The excavated material and scarified bitumen that are likely to be generated from the project corridor is estimated to be 22,000 and 430,000 cum respectively. Disposal of the debris will have impact on the local topography, hence as a resource recovery approach, the excavated waste shall be tested for the CBR values and if found suitable will be used as a subgrade material, for strengthening the embankment (or) as a strengthening layer for village and approach roads. |
| 6. | Surface and ground water quality | (i) Surface water: with exemption to suspended solids, all other key parameters are well within the permissible limits of prescribed drinking water standards and it is found suitable for construction, with prior water treatment for the removal of suspended solids would make the surface water suitable for domestic purpose as well. (ii) Groundwater: key water quality parameters like Chloride, Suspended solids and Copper were observed to have high concentration, with exemption of the mentioned parameters other key parameters are well within the stipulated drinking water standards (IS 10500) and hence the prior water treatment would make the groundwater suitable for domestic purposes. Extraction of groundwater in the project area for construction purpose shall be prohibited due to the project district is declared as 'Over Exploited Zone' by Ground Water Resource Development Centre (GWRDC) and hence the Concessioner shall seek for surface water as an alternate to the groundwater source. Further exploring groundwater shall lead to groundwater resource depletion. |
| 7. | Air quality impact at the habitations/ settlements <ul style="list-style-type: none"> • Rampura (Ch103+200) • Udalpur(Ch109+000) • Dabhala(Ch115+500) • Vasai (Ch119+000) • ViharChowkdi (Ch127+000) • Pilvai(Ch134+000) • Vijapur(Ch139+000) • Ranchoipur(Ch144+000) and • Himatnagar (Ch161+000 to 163+650) | Air pollution due to construction yard will be particularly ground-based with localised effect during the construction period. It is required that the construction yard shall be located away from the settlement, all construction machineries (Crushers, Hot-mix Plants & Batching Plants) should be kept/stationed 1000m away from the settlements. |
| 8. | Noise pollution at settlements and sensitive receptors <ul style="list-style-type: none"> • Rampura (Ch 103+200) • Udalpur(Ch 109+000) • Dabhala(Ch 115+500) • Vasai (Ch 119+000) • ViharChowkdi (Ch 127+000) • Pilvai(Ch 134+000) • Vijapur(Ch 139+000) • Ranchoipur(Ch 144+000) and Himatnagar (Ch 161+000 to 163+650) Sensitive Receptors: <ul style="list-style-type: none"> • Sri Saraswati Vidyalaya, (Ch109+000) • Health Centre, Udalpur (Ch. 109+250) • Veer Maharaj Temple (Ch. 117+700) • PalshwarMahadev Temple, Vasai (Ch. 119+600) • Govt. Hospital (Animal Husbandry) (Ch.119+825) • Sree Ram Foundation (Ch.124+000) • Umiya Mata Temple (Ch.126+475) • Chanakya VidyaMandir (Ch. 127+175) • RadhaswamiSatsang Hall (Ch132+025) | Noisy construction activities (such as crushing, concrete mixing, batching etc.) within 150m of the nearest habitation/ educational institutes/health centres (silence zones) shall be stopped during the night time between 9.00 pm to 6.00 am. Concessionaire shall provide noise barriers at the suggested locations at the identified locations viz., schools/ Temples/health centres prior to commencement of work. |

| Sl.No | Impact | Mitigation Measures |
|-------|---|---------------------|
| | <ul style="list-style-type: none">• Pilvai Primary School (134+675)• Govt. High School, Pilvai (Ch135+440)• KamlaSanskarPeethVidyalaya (Ch135+850)• Anganwadi School(Ch136+730)• St. Xavier School and College (Ch161+500)• Govt Hospital (Ch162+300)• MMI Trust Women's College (Ch162+525)• Kendriya Vidyalaya (Ch162+825) | |

3. PILOT GREEN HIGHWAYS INITIATIVE

15. Vijapur – Himatnagar section (Ch 140+000 to Ch 163+000) of the Mehsana – Himatnagar corridor has been identified as a pilot corridor where the green highway interventions are proposed to be integrated as part of the proposed widening of the existing two lane facility to four lane.

(i) Warm Mix Asphalt instead of Hot Mix Asphalt

16. A section of the Mehsana – Himatnagar corridor from Ch 129+000 to Ch136+000 is proposed for the new construction, due to poor/ damaged pavement. Hence it is decided to test the performance of the WMA on a pilot basis for a 2km stretch. Based on its success, the WMA shall be recommended for other corridors as an alternative to HMA. The specification of the WMA is detailed in the technical specification of the BoQ along with the required quantity.

17. The various advantages of WMA in comparison with HMA are listed below:

- 30% reduction in energy consumption that would be used in drying and heating of aggregate,
- Significantly reduced levels of carbon dioxide emissions (30%) and dust emissions (50-60%),
- The technology does not involve any major modification to the mixing plant and construction procedure,
- Less concern for temperature drop during mix transportation leading to expansion of construction season and increase of haul distances,
- Compacting effort is less so as to achieve a specific compaction level, and
- Carbon credits may be earned under the Kyoto Protocol if WMA is used as a replacement of HMA on account of reduction of greenhouse gases

(ii) Recycling of Pavement

18. Adopting the green concept of 3 R's (Recovery, Recycle and Reuse), the recycling of the existing pavement has been suggested. Based on the quality of the sub grade materials, it is proposed to recycle them for the purpose of pavement, strengthening embankment etc. In case if it does not meet the requirements in terms of quality, it shall be recycled as pavement for the approach road/ village roads. The concept is included as a condition in the contract document, stating that a minimum of 20% of the excavated pavement (86,000 cum) shall be recycled.

(iii) Enhancement measures for Cultural / Institutional Assets

19. Adoption of location specific avoidance measures through localized design interventions and protection measures has ensured that only 11 cultural and community assets are being impacted, which includes 6 temples (1 major impact and 5 minor impact), 4 shrines (3 major impact and 1 minor impact) and a Mosque. The details of the impacted structures are given in the Resettlement Action Plan (RAP). For the affected structures the compensation and assistance will be provided in line with the Resettlement Policy Framework (RPF) adopted for the project.

20. In addition, enhancement measures to some of the cultural and community assets have been included. These have been identified based on consultations with the communities/stakeholders, through an objective evaluation of the use, importance, values to the communities. Enhancement measures like provision of foot path, gate, boundary wall, fencing, tree plantations are suggested. Along this corridor, two temples (i) PaleshwarMahadev Temple (Ch119+600) and Chikotar Mata Temple (Ch136+050) have been selected (Table 3.1) and enhancement designs were worked out (**Appendix 3**) and the cost provisions have been included in the EMP budget.

Table 3.1: Selected Enhancement Measures for Proposed Project corridor

| Sl. No. | Chainage | Name of Structure | Side | Distance from CL (m) | Age (in Years) | Size | Ownership | Building type |
|---------|----------|----------------------|------|----------------------|----------------|-------|-----------|---------------|
| 1 | 119+600 | Shiv Temple | RHS | 5.5 | 1200 | Large | Temple | Pucca |
| 2 | 136+650 | ChikotarMaata temple | LHS | 16 | 100 | Large | Temple | Pucca |

Source: DPR, LASA

(iv) Use of renewable energy

21. In line with the GoG initiatives to foster initiatives towards exploration and adoption of non-conventional energy sources, the street lights along the corridors, including lighting at the junctions, bus stops, truck laybay etc., are proposed to be battery mounted solar street lights (Table 3.2). Unlike other conventional solar street lights, the proposed standalone street lights in the pilot green highway stretch will be located in the median and will have the backup battery mounted Solar PV with illumination more than the conventional street light, this will have advantages like

- (i) Free from the disturbance arising due to the avenue tree canopy
- (ii) Prevents vandalism
- (iii) Reflects a symbolic representation of green highways to the road users/ public

Table 3.2: Solar Street Light Locations along the Green Highway

| Sl.no | Location | Chainage | | Length |
|-------|----------------------|----------|---------|--------|
| | | From | To | |
| 1 | Rampura intersection | 103.225 | 103.325 | 0.100 |
| 2 | Dabhala intersection | 117.000 | 117.125 | 0.125 |
| 3 | Vihar | 126.900 | 127.000 | 0.100 |
| 4 | Vijapur Intersection | 135.200 | 135.525 | 0.325 |
| 5 | Vijapur | 138.300 | 141.100 | 2.800 |
| 6 | Himatnagar | 161.275 | 163.786 | 2.511 |

Source: DPR, LASA

22. The bid documents detailing the annuity contract for the corridor shall specify the illumination levels required along the stretches. Budgetary provision for the proposed solar street light is given in the project cost (civil cost) and the specification for the same is provided in the bid document/ Concessionaire agreement.

(v) Tree Transplantation

23. The objectives of the tree transplantation are

- (i) To preserve the trees within 30 to 90cm girth size or trees which are seven to ten years old.
- (ii) Transplantation is done in goucher land belonging to local panchayat (or) government land in order to increase the green cover on waste land/ places.

(iii) In addition, tree transplantation shall also be carried out in the nearby sensitive locations such as schools, hospitals, cultural properties etc, as a landscaping measure as well to act as a noise barrier.



Figure 3.1: Few Snap shots of trees suitable for tree transplantation

24. Based on the above objectives, reconnaissance survey has been conducted for the project corridor and the trees suitable for transplantation have been identified and recorded. It has been observed that 516 trees (Table 3.3) are suitable for transplantation, the trees species includes Gulmohar (*Delonix regia*) and Babul (*Acacia nilotica*) dominates the number followed by Neem (*Azadirachta indica*) and other tree species.

Table 3.3: List of Trees-species wise (Girth size below 90cm)

| Chainage | | LHS | | | | RHS | | | | |
|----------|--------|----------|------|-------|---------------------|---------------------|------|-------|---------------------|----|
| | | Gulmohar | Neem | Babul | Other (Local Names) | Gulmohar | Neem | Babul | Other (Local Names) | |
| 140+00 | 141+00 | 3 | 2 | 1 | 1 | Pipal | 1 | 0 | 0 | 0 |
| 141+00 | 142+00 | 2 | 2 | 1 | 2 | Pipal/Khijda | 8 | | 7 | 6 |
| 142+00 | 143+00 | 16 | | 10 | 4 | Pipal | 0 | 1 | 22 | 0 |
| 143+00 | 144+00 | 27 | | 6 | 4 | Adussa/Pipal/Sagvan | 40 | 6 | 2 | 2 |
| 144+00 | 145+00 | 2 | 3 | 3 | 0 | | 3 | 2 | 2 | 1 |
| 145+00 | 146+00 | 9 | 5 | 7 | 4 | Adussa | 2 | 0 | 13 | 10 |
| 146+00 | 147+00 | - | - | - | - | - | - | - | - | - |
| 147+00 | 148+00 | | 1 | 21 | 12 | Khijda/Pipal | 2 | 1 | 12 | 2 |
| 148+00 | 149+00 | | 1 | 5 | | | 0 | | 5 | 1 |
| 149+00 | 150+00 | 2 | 5 | | 1 | Khijda | 0 | 9 | 4 | 4 |
| 150+00 | 151+00 | 4 | 3 | 2 | 0 | | 2 | 10 | 9 | 3 |
| 151+00 | 152+00 | 3 | 3 | 1 | 0 | | 6 | 2 | 2 | 2 |
| 152+00 | 153+00 | 2 | 4 | 0 | 2 | Khijda | 5 | 3 | 7 | 3 |
| 153+00 | 154+00 | 4 | 4 | 0 | 1 | Pipal | 5 | 14 | 6 | 1 |
| 154+00 | 155+00 | 0 | 0 | 0 | 0 | | 4 | 4 | 24 | 5 |
| 155+00 | 156+00 | 15 | 1 | 0 | 3 | Khijda/ Adussa | 1 | 3 | 61 | 0 |
| 156+00 | 157+00 | 16 | 3 | 0 | 1 | Khijda | 2 | 5 | 13 | 4 |
| 157+00 | 158+00 | 2 | 19 | 0 | 0 | | 2 | 4 | 14 | 4 |
| 158+00 | 159+00 | 10 | 11 | 0 | 0 | | 1 | 2 | 15 | 5 |
| 159+00 | 160+00 | 0 | 1 | 0 | 1 | Khijda | 0 | 0 | 14 | 1 |
| 160+00 | 161+00 | 0 | 0 | 0 | 0 | | 0 | 0 | 9 | 3 |
| 161+00 | 162+00 | 2 | 3 | 0 | 4 | Ashoka | 20 | 6 | 2 | 9 |
| 162+00 | 163+00 | 5 | 3 | 0 | 0 | | 13 | 1 | 2 | 1 |
| 163+00 | 164+00 | 0 | 2 | 0 | 0 | | 5 | 8 | | 6 |
| Total | | 124 | 76 | 57 | 40 | | 122 | 81 | 245 | 73 |

Total trees (other than Babul species) - 516

Source: Detailed Assessment by LASA, 2012

25. As per the discussion had with the forest officials, on submission of the tree transplantation proposal, the forest department will identify the suitable land for tree

transplantation. In case, if large number of trees needs to be transplanted, the forest department will seek the project proponent assistance in identifying land for transplantation. The cost for the tree transplantation shall be collected/ paid along with the compensatory afforestation (CA) and NPV cost.

26. As an alternative measure, the land suitable for tree transplantation has been identified along the green highways stretch, it shall be transplanted either in the goucher land (or) revenue land (available at the bank of Sabarmathi River) and few trees shall be located in R&BD land (office spaces available along the project corridor). The goucher lands are waste lands available within the panchayat limit or government land which is generally used for grassing. With prior permission from the village panchayat, the trees shall be transplanted.

27. The availability of the land has been identified based on the community consultation with the villagers and the classification of land is done based on the survey numbers. The details of the goucher land available along the green highways are presented in Table 3.4. It is evident from the information that the available land is more than sufficient for the estimated trees (516 nos) that are to be transplanted.

28. As per the discussion had with the revenue officials, the availability of the barren revenue land is confirmed along the Sabarmathi River. The identified area is located close to the green highways stretch; hence there are no implications in tree transplantation. With prior permission from the District Collector, the trees shall be transplanted.

29. As an enhancement measure, 23 tree plantations are suggested for a Shiva temple at Ch 119+600, hence the trees that are to be transplanted shall be located in the temple, and this will considerably reduce the new plantation cost. Pockets of R&BD land belonging to the regional office are identified along the project corridor, it is suggested that the available space shall also be utilised for tree transplantation. The budget for tree transplantation is given as a separate item in the EMP Budget.

Table 3.4: Details of Goucher Land along the Project Corridor

| S.No. | Chainage | Side | Village Name | Khasra Number | Area (Ha) | Distance from C.L. |
|---------------------------------------|----------|-----------|--------------|---------------|----------------|--------------------|
| 1. | 143+050 | Both Side | Vijapur | 159 | 0.526 | Adjacent |
| 2. | 141+200 | LHS | Vijapur | 2147 | 3.31 | Adjacent |
| 3. | 143+850 | LHS | Ranchorpura | 45 | 0.74 | Adjacent |
| 4. | 145+100 | Both Side | Ranchorpura | 17 | 15.75 | Adjacent |
| 5. | 143+300 | LHS | Devpura | 106 | 5.31 | 25m |
| 6. | 145+800 | Both Side | Devpura | 38 | 55.85 | Adjacent |
| 7. | 145+500 | LHS | Devpura | 39 | 0.74 | Adjacent |
| 8. | 145+700 | LHS | Devpura | 44 | 0.76 | 35m |
| 9. | 145+100 | LHS | Devpura | 60 | 1.83 | 50m |
| 10. | 149+150 | LHS | Derol | 104 | 23.92 | Adjacent |
| 11. | 149+850 | RHS | Derol | 338 | 155.48 | Adjacent |
| 12. | 151+700 | LHS | Derol | 714 | 318.06 | Adjacent |
| 13. | 157+100 | RHS | Dedhrota | 669 | 8.13 | 50m |
| 14. | 158+300 | RHS | Dedhrota | 672 | 0.323 | Adjacent |
| 15. | 161+400 | LHS | Savgadha | 138 | 20.47 | Adjacent |
| 16. | 161+500 | LHS | Savgadha | 134 | 0.8 | 40m |
| 17. | 162+900 | RHS | Parbada | 289 | 13.25 | Adjacent |
| 18. | 163+450 | LHS | Parbada | 299 | 1.76 | 40m |
| 19. | 163+780 | RHS | Dhandha | 18 | 2.77 | Adjacent |
| Total Land area available (ha) | | | | | 629.779 | |

Source: Detailed Assessment by LASA, 2012 and land information

(vi) Cattle Crossings

30. Two options of cattle crossing had been explored (i) at grade crossing and (ii) cattle underpass. Based on the survey, the number of cattle's crossing the corridor is insignificant and hence having a dedicated underpass for cattle crossing may not be necessary. Moreover the high costs involved in the construction and maintenance rules out the feasibility to have an underpass. Hence, it is decided to have At-grade crossing at the identified cattle crossing locations (Table 3.5) provided with cautionary signs at 120m prior to the cattle crossing location as per IRC norms. The irregular movement of the cattle along the project corridor shall be restricted by creating awareness/ capacity building among the villagers, guiding them to use the dedicated cattle crossings. These activities shall be initiated by a dedicated facilitating agency that needs to be hired for implementing this green Initiative for this project corridor.

Table 3.5: Details of Cattle Crossing Locations along the Project Corridor

| Sl. No. | Villages | Cattle crossing locations (Chainage) | Alternate path to avoid irregular crossing |
|---------|---|--|---|
| 1. | Rampura village (Near Bheemnath Temple) | 102+300, 102+800 | The cattle crossing at Ch 102+800 shall be restricted (i) due to an existing alternate path/ route which connects Ch 102+300. (ii) the goucher land is located close to Ch 102+300. |
| 2. | Deverasan village | 105+330, 105+580, 105+950 | No alternate path/ route is available to approach the nearby goucher land and hence dedicated cattle crossing is required. |
| 3. | Udalpur | 108+000 to 110+000 | |
| 4. | Vasai village (Near Shiv Temple) | 119+700 | |
| 5. | Bilodra village | 129+600 | |
| 6. | Pilvai village | 134+300 | |
| 7. | Derol Village | 147+100, 148+700, 149+900, 150+020, 151+100, 152+200 | |

Source: Detailed Assessment by LASA, 2012

(vii) Solid Waste Management

31. The reconnaissance survey conducted reveals that the solid waste management practice adopted along the green stretch from Vijapur to Himatnagar is not organised and systematic. The two settlements of Himatnagar and Vijapur and the small/medium industries located near Vijapur are identified as key waste generators present along this corridor. The consultation reveals the reasons for the road side dumping and they are as follows

- (i) Lack of bins within the settlement and the irregularity in the collection, especially along the Himatnagar stretch areas and
- (ii) Open disposal of industrial wastes onto the RoW. The absence of efficient collection mechanisms results in the industries to dump their wastes on to the government lands outside their settlement limits (Ch 141+200).

32. As one of the green Initiative measures, options for dedicated solid waste management practice along the green highways are explored. Dust bins shall be provided at the locations Ch139+500, 144+200, 161+100, 163+100 and 163+600 to improve the solid waste management in the project area (from Vijapur to Himatnagar section). The responsibility of collection and disposal of waste from these bins shall remain with the concerned municipalities/ panchayat.

(viii) Landscaping

33. Landscaping is limited to certain stretches due to space constraints. The stretch from Ch 161+400 to Ch 163+350 has been chosen to provide landscaping in the parking areas; the landscaping includes provision of shrubs, lawn and seating arrangement for public (Figure 3.2). The cost for the same has been worked out and the same is included in the civil/engineering cost.

34. For the stretch Vijapur – Himatnagar section (Ch 140+000 to Ch 161+400), vertical creepers are chosen as landscaping measure to provide an aesthetic appearance. The local creeper species are recommended for the landscaping, which includes Akebia (*Akebiaquinata*), Porcelain Berry Vine (*Ampelopsis brivipendunculata*), Trumpet Vine (*Campsisradicans*), American Bittersweet (*Celastruscandens*), Winter Jasmine (*Jasminumnudiflorum*), Chilean Jasmine (*Mandevillalaxa*), Virginia Creeper (*Parthenocissusquinquefolia*), Passion Vine (*Passiflorapfordtii*), Allamanda creeper (*Allamanda Cherry Ripe, AllamandaViolacea*), Creeping Fig (*Ficuspumila*). The cost for implementation and maintenance are worked out and are included in the EMP Budget.

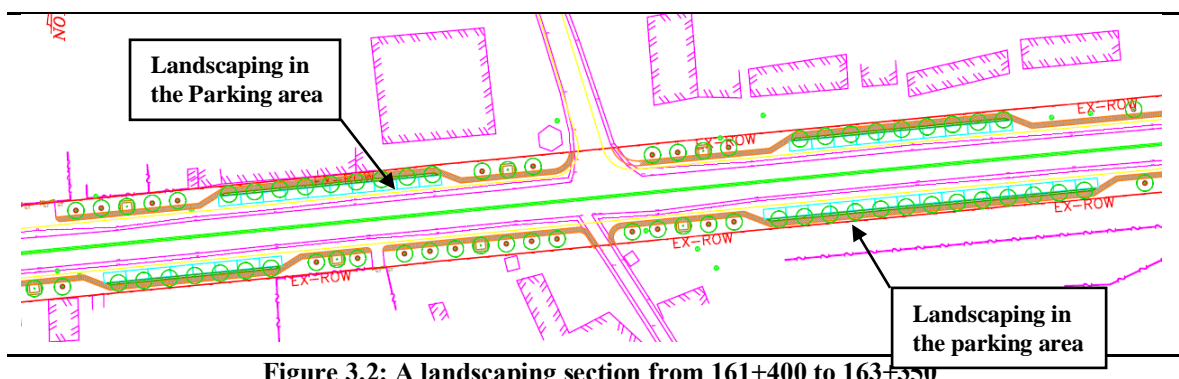


Figure 3.2: A landscaping section from 161+400 to 163+350

(ix) Other Green Initiatives

35. Green highways initiatives like utilisation of (i) Fly ash, (ii) Dry swales and Porous pavement for groundwater recharge and (iii) Quiet pavement for less noise generation due to the moving traffic are considered and studied in detail. However, due to the following reasons the green initiatives are not recommended.

- i. **Fly ash:** Due to the high demand from brick industries, the availability of the fly ash is found to be limited, the quality of the residual ash from the ash pond was found to be unfit for construction purposes and hence the usage of fly ash in this project has not been recommended.
- ii. **Dry Swale and Porous pavement:** Due to the space constraints the dry swales are not recommended for this project. The usage of porous pavement was not successful due to the high maintenance requirement and hence both the groundwater recharging green initiatives are not recommended.
- iii. **Quiet pavement:** Vehicles should maintain an average speed of 50-60km and above in order to achieve the reduction in the noise levels. Hence in view of the road safety, heavy vehicles/trucks moving at a high speed in the urban stretches will induce accident. Sensitive receptors like schools, hospitals and community centres are found to be less and are not

located near the corridor and hence there are no proper justifications to have quiet pavement in the green corridor.

(x) Green Initiative Budget

| Sl.No | Particulars | Specifications | Units | Quantity | Rates | Cost | Remarks |
|--------------------------------------|----------------------------------|--|-------|----------|--------------|----------------------|--------------------------------------|
| 1 | Tree transplantation | Trees having girth size ranging from 30 to 90 cm, with an exception of babool trees (or) Wild bushes | Nos | 516.0 | 8,000.00 | 4,128,000.00 | Included in the EMP Budget |
| 2 | Solid Waste Management | Provision of galvanic waste collection Bins with size 1280 liters | Nos | 10.0 | 20,000.00 | 200,000.00 | |
| 3 | Facilitating agency | Conducting awareness campaign, training and monitoring (assuming facilitating agency service is required for 15 years) | LS | 5.0 | 1,200,000.00 | 6,000,000.00 | |
| 4 | Landscaping | Plantation of vertical creepers along the project - construction phase | Nos | 4000.0 | 800.00 | 3,200,000.00 | |
| | | Maintenance of planted creepers - operation phase | LS | 15.0 | 60,000.00 | 900,000.00 | |
| 5 | Renewable Energy | | | | | | Included in the Project (Civil) Cost |
| 5.1 | Solar Street Light | 1 x 11 w CFL PV Module : 74 W Battery Capacity : 12V, 75 AH | Ea. | 1020.0 | 24,000.00 | 2,44,80,000.00 | |
| | | 2 x 11 W CFL (Double Luminaire with One CFL each), PV Module : 120W Battery Capacity : 12V, 100 AH | Ea. | 327.0 | 34,000.00 | 1,11,18,000.00 | |
| 5.2 | Construction Zone | Single luminaire with 2 CFL | Nos | 8.0 | 45,300.00 | 362,400.00 | |
| 6 | Cattle crossing | Provision of additional signage's, designated markings and rumble strips at all cattle crossing locations | Nos | 28.0 | 5,680.00 | 159,040.00 | |
| 7 | WMA (included in the civil cost) | Providing WMA for a 2km stretch in M-H corridor -BC | Cum | 1220.0 | 7,300.00 | 89,06,000.00 | |
| | | Providing WMA for a 2km stretch in M-H corridor -DBM | Cum | 2744.0 | 6,251.00 | 1,71,52,744.00 | |
| Total Green Intervention Cost | | | | | | 76,606,184.00 | |

4. ENVIRONMENTAL MANAGEMENT PLAN

36. A description of the various management measures during various stages of the project are provided in Table 4.1.

4.1 PRE-CONSTRUCTION STAGE

4.1.1 Pre-Construction Activities by PIU

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

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

4.1.2 By Concessionaire/Independent Engineer

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

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

4.2 CONSTRUCTION STAGE

4.2.1 Construction stage activities by the Concessionaire

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

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

40. There are several other environmental issues that have been addressed as part of good engineering practices, the costs for which have been accounted in the engineering costs. They include improvement of roadside drainage, provision of additional cross drainage structures or raising the road height in low-lying stretches, reconstruction and improvement of bunds of the affected water bodies.

4.3 OPERATION STAGE

41. Monitoring the environmental attributes during the entire concession period shall be carried out by the Concessionaire as laid down in the monitoring plan. The compliance to the environmental monitoring by the Concessionaire shall be confirmed by the Independent Engineer.

Table 4.1: Environmental Management Plan

| Environmental Issues | | Ref: Clauses | Additional Measures to be Adopted by the Concessionaire | | Location ³ | Responsibility |
|----------------------|-------------------------------|--|--|---|--|--|
| 1. | Pre-Construction Stage | | | | | |
| | 1.1. | Pre-construction activities by PIU | | | | |
| | 1.1.1. | Utility Relocation and Common Property Resources (CPRs) | Clause 110.1. and 110.7 of MoRTH | <ul style="list-style-type: none"> PIU and concerned line departments shall take necessary precautions, and shall provide barricades/delineation of such sites to prevent accidents including accidental fall into bore holes, pits, drains both during demolition and construction/ relocation of such facilities. Standard safety practices shall be adopted for all such works. | Corridor of Impact. | PIU |
| | 1.2. | Pre-construction activities by the Concessionaire/Independent Engineer (IE) | | | | |
| | 1.2.1. | Joint Field Verification | | <ul style="list-style-type: none"> The Concessionaire and Independent Engineer shall ascertain the feasibility of implementing the Environmental Management Plan (EMP) through Joint field verification. Any observations / modification required in updating EMP shall be done by the Independent Engineer and a copy of the modified EMP shall be submitted to the PIU for review and approval. | Along the project corridor | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 1.2.2. | Procurement of Machinery | | | | |
| | 1.2.2.1 | Crushers, Hot-mix Plants & Batching Plants | (i) Emission control legislations of CPCB/ GPCB for air, noise etc. (ii) Clause 111.5 of MoRTH (Pollution from Hot mix and Batching Plant) | <ul style="list-style-type: none"> The Concessionaire shall follow all stipulated conditions for pollution control as suggested by the GPCB in the consent/ NoC for establishing and operating the Hot-mix and Batching Plant. No such installation by the Concessionaire shall be allowed till all the required legal clearances are obtained from the competent authority and the same is submitted to the PIU. The location of the hot-mix and batching plant shall be at least (i) 1000m away from settlements and shall be placed in the downwind direction and (ii) 10 km aerial distance away from the protected areas (sanctuary, national parks etc.). The Concessionaire shall submit the detailed layout plan for approval to the Independent Engineer before getting into formal agreement with landowners for setting up of such site. Actions by Independent Engineer and PIU against any non-compliance shall be borne by the Concessionaire at his own cost | All construction machineries (Crushers, Hot-mix Plants & Batching Plants) should be kept/stationed 1000m away from settlements: <ul style="list-style-type: none"> Rampura (Ch 103+200) Udalpur (Ch 109+000) Dabhala (Ch 115+500) Vasai (Ch 119+000) Vihar Chowkdi (Ch 127+000) Pilvai (Ch 134+000) Vijapur (Ch 139+000) Ranchodpur (Ch 144+000) and Himatnagar (Ch 161+000 to 163+650) | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 1.2.2.2. | Other Construction Vehicles, Equipment and Machinery | Discharge standards and Noise limits as per Environment Protection Act, 1986 (EPA) Emission standards as per Bureau of Indian Standard (BIS) preferably Bharat IV emission norms | <ul style="list-style-type: none"> Equipment's conforming to the latest noise and emission control measures shall be used. Pollution under Control (PUC) certificates for all vehicles and machinery shall be made available to the Independent Engineer and PIU for verification whenever required. | Along the project corridor | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |

³ All locations are referred to design chainages

| Environmental Issues | | Ref: Clauses | Additional Measures to be Adopted by the Concessionaire | Location ³ | Responsibility |
|----------------------|----------|--|--|---|--|
| | 1.2.3. | Identification & Selection of Material Sources | | | |
| | 1.2.3.1. | Borrow Areas | <p>Clause 305.2.2. of MoRTH Clause 111.2 (borrow pits for embankment construction)</p> <ul style="list-style-type: none"> The Independent Engineer shall inspect every borrow area location prior to issuing approval for use of such sites. Care shall be taken to avoid agriculture areas for planning haul roads for accessing borrow materials. In case of damage, the Concessionaire shall be solely responsible and shall rehabilitate it, as approved by Independent Engineer. All borrow areas shall be restored either to the original condition or as per the approved rehabilitation plan by the Independent Engineer, immediately upon completion of the use of such a source. | <p>Source of borrow area at :</p> <p>Vasai Fatiya pond (Ch 117+000), Devrasan (Ch 104+000), Near Derol Bridge (Ch.146+500), SundraTakaranVasai (Ch 117+000) Pilvai (Ch.134+500) SH-55 (Ch. 158+000) SH-55 (Ch. 99+000)</p> | <p>(i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE</p> |
| | 1.2.3.2. | Quarries | <p>Clause 111.3. of MoRTH (procuring Quarry materials)</p> <ul style="list-style-type: none"> No quarry and/or crusher units shall be established, which is within 1000m from the residential/ settlement locations, forest boundary, wildlife movement path, breeding and nesting habitats and national parks/sanctuaries. Concessionaire shall work out haul road network to be used for transport of quarry materials and report to Independent Engineer who shall inspect and approve the same. | <p>Nearest Quarry locations are at:</p> <p>Durga, Sathamba (50km from Ch 164+000) Simli,Chogamada (80 km from Ch 164+000) Shiv Shakti, Sevalia (130km from Ch 164+000) Vadgam (100km from Ch 164+000)</p> <p>New quarry area should be located 1000m from the following locations:</p> <ul style="list-style-type: none"> Rampura (Ch 103+200) Udalpur(Ch 109+000) Dabhala(Ch 115+500) Vasai (Ch 119+000) ViharChowkdi (Ch 127+000) Pilvai(Ch 134+000) Vijapur(Ch 139+000) Ranchodpur(Ch 144+000) and Himatnagar (Ch 161+000 to 163+650) | <p>(i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE</p> |
| | 1.2.3.3. | Arrangement for Construction Water | <ul style="list-style-type: none"> The Concessionaire shall source the requirement of water preferably from surface water bodies, rivers, canals and tanks in the project area. To avoid disruption/disturbance to other water users, the Concessionaire shall extract water from fixed locations. The Concessionaire shall consult the local people before finalizing the locations. Only at locations where surface water sources are not available, the Concessionaire can contemplate extraction of ground water, after intimation and consent from the Independent Engineer. The Concessionaire shall comply with the requirements of Gujarat Groundwater Authority and seek their approval for extraction of ground water. | <p>All rivers / surface water bodies that can be utilized within the project area</p> | <p>(i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE</p> |

| Environmental Issues | | Ref: Clauses | Additional Measures to be Adopted by the Concessionaire | Location ³ | Responsibility |
|----------------------|---------------|--|--|---|--|
| | 1.2.3.4. | Sand (all river and stream beds used directly or indirectly for the project) | Clause 111.3. of MoRTH <ul style="list-style-type: none"> In case of selection of new sites for sand quarrying, the Concessionaire shall obtain prior approval and concurrence from Competent District Authority. To avoid accidents and caving in of sand banks at quarry sites, sand shall be removed layer by layer. Digging deeper than the permissible limit (0.9 metres) shall not be allowed. Such quarry shall be barricaded 10m away from the periphery on all sides except the entry point, so as to prevent accidental fall of domestic cattle, wildlife and human beings. | Nearest sand quarries locations: Sabarmati river (Ch 146+500) | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 1.2.4. | Setting up construction sites | | | |
| | 1.2.4.1 | Construction Camp Locations – Selection, Design & Layout | Construction camps shall not be proposed: <ul style="list-style-type: none"> (i) Within 1000m of ecologically sensitive areas (if any) (ii) Within 1000m from the nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community | Nearest Habitations: <ul style="list-style-type: none"> •Rampura (Ch 103+200) •Udalpur(Ch 109+000) •Dabhala(Ch 115+500) •Vasai (Ch 119+000) •ViharChowkdi (Ch 127+000) •Pilvai(Ch 134+000) •Vijapur(Ch 139+000) •Ranchodpur(Ch 144+000) and Himatnagar (Ch 161+000 to 163+650) | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 1.2.4.2. | Arrangements for Temporary Land Requirement | Clause 108.3. of MoRTH <ul style="list-style-type: none"> The Independent Engineer shall ensure that the temporary site is cleared prior to handing over to the owner (after construction or completion of the activity) and it is included in the contract. | Areas temporarily acquired for construction sites / hot mix plants / borrow areas / diversions / detours | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 1.2.4.3. | Stock-yards | <ul style="list-style-type: none"> The Concessionaire shall identify the location for stockyards for construction materials at least 1000m from water courses. Separate enclosures shall be planned for storing construction materials containing fine particles such that sediment-laden water does not drain into nearby storm water drains. | Construction labor camps Nearest water body locations are at : Ponds: Ch 118+200,123+200, 133+025 and 144+500 River/Canal crossings: Major: Ch 146+525 (Sabarmati river) Minor: SujalamSuphalam canal at Ch.106+400 and 106+425 | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 1.2.4.4. | Fuel storage and refuelling areas | Clause 2.1.1.7. of EMP (Stripping of Soil) Clause 2.1.4.1.2 of EMP (dispose the spent oil and grease) <ul style="list-style-type: none"> The Concessionaire shall ensure that all construction vehicle parking locations, fuel/lubricants storage sites, vehicle, machinery and equipment maintenance and refuelling sites are located at least 500 m from rivers and irrigation canal/ponds. | Construction labor camps Canals and Ponds locations are at: Water body location: Ponds: Ch 118+200,123+200, 133+025 and 144+500 River/Canal crossings: Major: Ch 146+525 (Sabarmati river) Minor: SujalamSuphalam canal at Ch.106+400 and 106+425 | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 1.2.5. | Labour Camp Management | | | |

| Environmental Issues | | Ref: Clauses | Additional Measures to be Adopted by the Concessionaire | Location ³ | Responsibility | | |
|----------------------|---------------------------|---|---|---|---|--|--|
| | 1.2.5.1 | Location of Construction labour camps: Accommodation | Factories Act, 1948 and Building & other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 (construction & maintenance of labor camp) | <ul style="list-style-type: none"> The Concessionaire shall provide, if required, erect and maintain necessary (temporary) living accommodation and ancillary facilities for labourers, to standards approved by the Independent Engineer. Labour camps shall not be located within 1000m from the nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community. The location, layout and basic facility provision of labour camps shall be submitted to Independent Engineer for approval prior to construction. | Along the project corridor, at the locations where construction labor camps are present | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE | |
| | 1.2.5.2 | Potable Water | The Contract Labour (Regulation and Abolition) Act, 1970 and Factories Act, 1948 | <ul style="list-style-type: none"> The Concessionaire shall supply potable water through municipal/ panchayat sources. In case of groundwater it shall be treated prior to supply. | Construction labor camps | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE | |
| | 1.2.5.3 | Sanitation facilities | Factories Act, 1948 for sanitation | <ul style="list-style-type: none"> The sanitation facilities for the camp shall be designed, built and operated in such a fashion that no health hazards occurs and no pollution to the air, ground water or adjacent water courses take place. | Construction labor camps | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE | |
| | 1.2.5.4 | Waste Disposal | Municipal Solid Waste (Management and Handling) Rules – 2000 for effective waste disposal | <ul style="list-style-type: none"> The Concessionaire shall provide garbage bins in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner | Construction labor camps | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE | |
| | 1.2.5.5 | HIV/ AIDS Prevention Measures | | <ul style="list-style-type: none"> The Concessionaire shall implement the following measures towards ensuring HIV/AIDS prevention during the entire contract period (i) conduct awareness campaign including dissemination of IEC materials on HIV/AIDS for all construction personnel (including labourers, supervisors, engineers and consultants) on HIV/AIDS/STDs within 3 months of mobilization and once a year subsequently during the contract period; (ii) carry out screening of construction personnel for HIV/ AIDS, within the 3 month of mobilisation (iii) conduct semi-annual health check-up of all construction personnel including testing for STDs; (iv) erect and maintain hoardings/ information signages on HIV/AIDS prevention at the construction sites, labour camps and truck parking locations; (v) install condom vending machines at the labour camps, including replenishment of supplies. | Construction & labor camps | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE | |
| 2. | CONSTRUCTION STAGE | | | | | | |
| | 2.1. | Construction Stage Activities by Concessionaire | | | | | |
| | | 2.1.1. | Site Clearance | | | | |
| | | 2.1.1.1. | Clearing and Grubbing | Clause 201. of MoRTH | <ul style="list-style-type: none"> All works shall be carried out in a manner such that the damage or disruption to flora is minimal. Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works shall be removed with prior approval from the Independent Engineer. | Along the project corridor at construction sites | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |

| Environmental Issues | | Ref: Clauses | Additional Measures to be Adopted by the Concessionaire | Location ³ | Responsibility |
|----------------------|----------|--|---|---|--|
| | 2.1.1.2. | Dismantling of Bridgework/ Culverts | Clause 202. of MoRTH <ul style="list-style-type: none"> The Concessionaire shall follow all necessary measures (including safety) especially while working close to cross drainage channels to prevent earthwork, stonework, materials and appendages from impeding cross drainage at rivers, streams, water canals and existing irrigation and drainage systems. | At locations where bridge works and culverts are proposed. River/Canal crossings: Major: Ch 146+525 (Sabarmati river) Minor: SujalamSuphalam canal at Ch.106+400 and 106+425 Bridges: 13 existing and 13 proposed Culverts: 41 existing and 50 proposed. | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.1.3. | Generation & disposal of Debris | Clause 202.5 of MoRTH. for Disposal of materials <ul style="list-style-type: none"> Disposal of unutilized non-toxic debris shall be either through filling up of borrow areas or at pre-designated disposal sites, subject to the approval of the Independent Engineer. At locations identified for the disposal of residual bituminous wastes, the disposal shall be carried out on top of a 60 mm thick layer of rammed clay so as to eliminate the possibility of leaching of wastes into the ground water. Debris generated due to the driving of piles or other construction activities along the rivers, streams and drainage channels shall be carefully disposed in such a manner that it does not flow into the surface water bodies or form puddles in the area. The pre-designated disposal locations shall be part of Comprehensive Solid Waste Management Plan that has to be prepared by the Concessionaire in consultation and with approval of Independent Engineer. | Throughout Project Corridor | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.1.4. | Non-bituminous construction wastes disposal | Clause 202. of MoRTH <ul style="list-style-type: none"> The Concessionaire shall finalise the location of disposal sites based on the following. <ul style="list-style-type: none"> not located within designated forest area does not impact natural drainage courses No endangered/rare flora is impacted by such dumping. Settlements are located at least 1000m away from the site. The Independent Engineer shall approve disposal sites after conformation | Disposal site locations | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.1.5. | Bituminous wastes disposal | Clause 202.5. of MoRTH <ul style="list-style-type: none"> The disposal of residual bituminous wastes shall be done by the Concessionaire at secure land fill sites, with the requisite approvals for the same from the concerned government agencies. | Disposal site locations | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.1.6. | Stripping, stacking and preservation of top soil | Clause 301.3.2 for stripping and preservation Clause 305.3.3 for construction and for embankments Clause 301.7. for preservation of Top Soil <ul style="list-style-type: none"> Concessionaire shall strip the topsoil at all locations that has been opened up for construction, including temporarily acquired land for traffic detours, storage, materials handling or any other construction related or incidental activities. | At all construction sites | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |

| Environmental Issues | | Ref: Clauses | Additional Measures to be Adopted by the Concessionaire | Location ³ | Responsibility |
|----------------------|--|---|--|---|--|
| | 2.1.1.7. Accessibility | | <ul style="list-style-type: none"> The Concessionaire shall provide safe and convenient passage for vehicles; pedestrians and livestock to and from roadsides and property accesses by providing temporary connecting road, as necessary. Construction activities that shall affect the use of side roads and existing accesses to individual properties, whether public or private, shall not be undertaken without providing adequate provisions to ensure uninterrupted access, as approved by the Independent Engineer. The Concessionaire shall take care that the cross roads are constructed in such a sequence that construction work over the adjacent cross roads are taken up in a manner that traffic movement in any given area does not get affected. | Throughout Project Corridor | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.1.8. Planning for Traffic Diversions and Detours | Clause 112. of MoRTH | <ul style="list-style-type: none"> Detailed traffic control plans shall be prepared by the Concessionaire and the same shall be submitted to the Independent Engineer. The Concessionaire shall provide specific measures for safety of pedestrians and workers as a part of traffic control plans. The Concessionaire shall ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow. The Concessionaire shall inform local community of changes in traffic routes and pedestrian access arrangements with assistance from Independent Engineer and PIU. | All along the project corridor, all access roads. Attention is required at: <ul style="list-style-type: none"> Rampura (Ch 103+200) Udalpur(Ch 109+000) Dabhla(Ch 115+500) Vasai (Ch 119+000) ViharChowkdi (Ch 127+000) Pilvai(Ch 134+000) Vijapur(Ch 139+000) Ranchodpur(Ch 144+000) Himatnagar (Ch 161+000 to 163+650). | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.2. Construction Materials | | | | |
| | 2.1.2.1. Earth from Borrow Areas for Construction | IRC 010-1961 (procurement of earth materials) | | All along the project corridor, all access roads, temporarily acquired sites & all borrow areas | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.2.2. Quarries | Clause 111.3. of MoRTH (procurement of materials) | | Nearest Quarry locations: Durga, Sathamba (50km from Ch 164+000) Simli., Chogamada (80 km from Ch 164+000) Shiv Shakti, Sevalia (130km from Ch 164+000) Vadgam (100km from Ch 164+000) | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.2.3. Blasting | Clause of 302. of MoRTH | | All blasting and Pre-splitting Sites. | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.2.4. Transporting Construction Materials | Clause 111.9. of MoRTH | <ul style="list-style-type: none"> All vehicles that are delivering materials to the site shall be covered to avoid spillage of materials. The unloading of materials at construction sites close to settlements shall be restricted to daytime only. | All along the Project corridor and all haul roads | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |

| Environmental Issues | | Ref: Clauses | Additional Measures to be Adopted by the Concessionaire | Location ³ | Responsibility |
|----------------------|---|---|---|--|--|
| | 2.1.3. Construction work | | | | |
| | 2.1.3.1. Disruption to other users of Water | Annexure "A" Protection of the Environment of MoRTH and Clause 2 Water Quality of MoRTH | <ul style="list-style-type: none"> In case of diversion of water bodies, the Concessionaire shall take prior approval of the competent authority and Independent Engineer for any such activity. The Independent Engineer shall ensure that Concessionaire has served the notice to the downstream users of water well in advance where such diversion of the flow is likely to affect the downstream population subject to the condition that under no circumstances the downstream flow shall be stopped. | | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.3.2. Drainage and Flood Control | Clause 202. of MoRTH | <ul style="list-style-type: none"> Concessionaire shall ensure that construction materials like earth, stone, ash or appendages disposed off does not block the flow of water of any water course and cross drainage channels. Where necessary, adequate mechanical devices to bailout accumulated water from construction sites, camp sites, storage yard, excavation areas are to be arranged well in advance before the rainy season besides providing temporary cross drainage systems. The Concessionaire shall take all adequate precautions to ensure that construction materials and excavated materials are enclosed in such a manner that erosion or run-off of sediments is controlled. Silt fencing shall be installed prior to the onset of the monsoon at all the required locations, as directed by Independent Engineer and PIU. The Concessionaire shall ensure that no material blocks the natural flow of water in any water course or cross drainage channel. Prior to monsoon, the Concessionaire shall provide either permanent or temporary drains to prevent water logging. | Surface water sources/ drains/ Nalahs/ Ponds etc. Silt fencing should be given near at: Ponds: Ch 118+200,123+200, 133+025 and 144+500 River/Canal crossings: Major: Ch 146+525 (Sabarmati river) Minor: SujalamSuphalam canal at Ch106+400 and 106+425 | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.3.3. Siltation of Water Bodies and Degradation of Water Quality | Clause 306. of MoRTH for soil erosion and sedimentation control | | Surface water sources/ drains/ Nalahs/ Ponds etc. Silt fencing at: Water body location: | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.3.4. Slope Protection and Control of Soil Erosion | Clause 306. of MoRTH for soil erosion and sedimentation control Clause 307. of MoRTH for Turfing works Clause 308. of MoRTH for other measures of Slope Protection | <ul style="list-style-type: none"> The Concessionaire shall construct slope protection as per the design or as directed by the Independent Engineer | High raise embankments and surface water bodies locations have been carried out by adopting Stone Pitching method at Stone Pitching at River/Canal crossings: Major: Ch 146+525 (Sabarmati river) Minor: SujalamSuphalam canal at Ch106+400 and 106+425 | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.4. Pollution Control | | | | |
| | 2.1.4.1. Water Pollution | | | | |

| Environmental Issues | | Ref: Clauses | Additional Measures to be Adopted by the Concessionaire | Location ³ | Responsibility | |
|----------------------|------------|--|---|---|---|--|
| | 2.1.4.1.1. | Water Pollution from Construction Wastes | <p>Schedule VI - General Standards for Discharge of Environmental Pollutants (Liquid Waste Disposal) - CPCB</p> <p>The Environment (Protection) Rules, 1986 and Water Act, 1974</p> | <ul style="list-style-type: none"> The Concessionaire shall take all precautionary feasible measures to prevent the wastewater generated during construction from entering into streams, water bodies or the irrigation channels. Concessionaire shall avoid construction works close to the streams or water bodies during monsoon. | <p>Locations at surface water drains/ sources/ nalahs/ ponds etc.</p> <p>Ponds: Ch 118+200,123+200, 133+025 and 144+500</p> <p>River/Canal crossings: Major: Ch 146+525 (Sabarmati river) Minor: Sujalamsuphalam canal at Ch 106+400 and 106+425</p> | <p>(i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE</p> |
| | 2.1.4.1.2. | Water Pollution from Fuel, Lubricants and Chemicals | <p>Petroleum Act and Rules and Environment (Protection) Rules, 1986 (Standards for Emission or Discharge of Environmental Pollutants Schedule – I) for Liquid Waste Disposal</p> <p>Clause 111. (Precaution and Safeguarding the Environment)</p> <p>Annexure ‘A’ to Clause 501 (Protection of Environment) - Section 2 water quality</p> <p>Clause 301.3.2 of MoRTH. (Stripping and preservation of top soil)</p> | <ul style="list-style-type: none"> Oil interceptors shall be provided at vehicle parking locations, wash down and refuelling areas. When fuel storage and refuelling areas are located on agricultural land or areas supporting vegetation, the top soil shall be stripped, stockpiled and returned after cessation of such storage. | <p>Surface water sources/ drains/ Nalahs/ Ponds etc.</p> <p>At locations:</p> <p>Ponds: Ch 118+200,123+200, 133+025 and 144+500</p> <p>River/Canal crossings: Major: Ch 146+525 (Sabarmati river) Minor: Sujalamsuphalam canal at Ch106+400 and 106+425</p> | <p>(i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE</p> |
| | 2.1.4.2. | Air Pollution | | | | |
| | 2.1.4.2.1. | Dust Pollution | <p>Annexure ‘A’ to Clause 501 (Protection of Environment) - Section 3 Air Quality</p> <p>Clause 111.5. of MoRTH. (Hot mix plant and batch mix plant)</p> | <ul style="list-style-type: none"> The conditions for pollution control given in the NoC (consent for establish and operate) by the GPCB shall strictly be followed. Air pollution monitoring shall be conducted as per the Environmental Monitoring Plan and results shall be used to identify any additional pollution control measures that require to be adopted. | <p>Construction area/ site, Construction camps, Materials Loading / unloading facilities</p> | <p>(i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE</p> |
| | 2.1.4.2.2. | Emission from Construction Vehicles, Equipment and Machineries | <p>Schedule-I: Standards for Emission suggested by CPCB/ GPCB</p> | <ul style="list-style-type: none"> Certificates issued for such contrivances that were obtained from designated/approved authority shall be submitted along with the specified reporting format to the Independent Engineer. The Concessionaire shall maintain a separate file and submit PUC certificates for all vehicles/equipment/machinery that are being used for the project. Monitoring results shall be submitted to Independent Engineer and PIU. | <p>Construction camps, Materials Loading / unloading facilities</p> | <p>(i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE</p> |
| | 2.1.4.3. | Noise Pollution | | | | |

| Environmental Issues | | Ref: Clauses | Additional Measures to be Adopted by the Concessionaire | Location ³ | Responsibility | |
|----------------------|------------|---|---|---|---|--|
| | 2.1.4.3.1. | Noise Pollution: Noise from Vehicles, Plants and Equipments | <p>Noise Limits for vehicles (Environment (Protection) Amendment Rules, 2000) and Part 'E', Schedule – VI of Environment (Protection) Rules, 1986.</p> <p>Clause 5A The Noise Pollution (Regulation and Control) Rules, 2000 (sound emitting construction equipments)</p> <p>Clause 201.2 of MoRTH for Idling of temporary trucks</p> | <ul style="list-style-type: none"> All plants and equipment used in construction shall strictly conform to the MoEF/ CPCB noise standards. Noisy construction activities (such as crushing, concrete mixing, batching etc.) within 150m of the nearest habitation/ educational institutes/health centres (silence zones) shall be stopped during the night time between 9.00 pm to 6.00 am. Concessionaire shall provide noise barriers to the suggested locations of identified schools/ Temples/health centres prior to commencement of work. Monitoring shall be carried out at the construction sites as per the monitoring schedule and results shall be submitted to Independent Engineer. Based on the monitoring results, the Independent Engineer, if required, shall recommend any additional noise mitigation measures required to be implemented by the Concessionaire. | <p>Sensitive receptors:</p> <ul style="list-style-type: none"> Sri SaraswatiVidyalaya, Udalpur (109+000) Community Health Centre, Udalpur (Ch. 109+250) Veer Maharaj Temple (Ch. 117+700) PaleshwarMahadev Temple, Vasai (Ch. 119+600) Govt. Hospital (Animal Husbandry, Ch.119+825), Sree Ram Foundation (Ch.124+000) Mata Temple (Ch.126+475) ChanakyaVidyaMandir (Ch. 127+175) RadhaswamiSatsang Hall (Ch 132+025) Primary School (Ch 134+675) Govt. High School, Pilvai (Ch 135+440) KamlaSanskarPeethVidyalaya (Ch 135+850) Anganwadi School (Ch 136+730) | <p>(i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE</p> |
| | | | | <ul style="list-style-type: none"> St. Xavier School and College (Ch 161+500) Govt Hospital (Ch 162+300) MMI Trust Women's College (Ch 162+525) KendriyaVidyalaya (Ch 162+825) | | |
| | 2.1.4.4. | Safety | | | | |
| | 2.1.4.4.1 | Safety Procedures | <p>The Concessionaire shall:</p> <ul style="list-style-type: none"> Comply with all applicable safety regulations, Take care of the safety of all personnel who are entitled to be on the Site, Use reasonable efforts to keep the site and works clear of unnecessary obstructions so as to avoid danger to personnel, Fencing, lighting, guarding and supervision of the works shall be carried out and provided until completion and taking over .It is necessary to provide any temporary works (including roadways, footways, guards and fences) as necessary, since the execution of these works, shall not raise a concern for the purpose of use and protection of the public and of owners as well as occupiers of adjacent land A construction safety checklist has been included (Appendix4 Form EM-8) | All construction sites | <p>(i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE</p> | |
| | 2.1.4.4.2 | Care and supply of Documents | <ul style="list-style-type: none"> The Concessionaire shall prepare, submit and obtain approval from the Independent Engineer for construction of the Safety Management Plan, and the same shall be prepared 14 days prior to commencement of construction works at site. | | <p>(i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE</p> | |

| Environmental Issues | | Ref: Clauses | Additional Measures to be Adopted by the Concessionaire | Location ³ | Responsibility |
|----------------------|-----------|--|--|---|--|
| | 2.1.4.4.3 | Concessionaires general obligations | <ul style="list-style-type: none"> All design calculations and fabrication drawings for temporary works (such as form-work, staging, centring, scaffolding, specialized construction, handling and launching equipment and the like) material lists for structural fabrication as well as detailed drawings for templates, and anchorage and temporary support details for pre stressing cables as well as bar bending and cutting schedules for reinforcement, etc shall be prepared by the Concessionaire at his own cost and forwarded to the Independent Engineer at least six weeks in advance of the actual constructional requirements. The Independent Engineer will check the same for the Concessionaire's use with amendments. | | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.4.4.4 | Personal Safety Measures for Labour, Material handling , Painting etc. | <p>Factory Act, 1948, Factories (Amendment) Act, 1987 (Chapter -5 Safety)</p> <p>Building and Other Construction Workers (Regulation of Employment and Conditions of Services) Act, 1996</p> <p>Construction Safety Plan shall be prepared by the Concessionaire during mobilization and approved by Independent Engineer and shall be adhered to by the Concessionaire throughout the construction period, and shall include provision of:</p> <ul style="list-style-type: none"> Protective footwear and protective goggles to all workers employed in mixing asphalt materials, cement, lime mortars, concrete etc. Welders protective eye-shields to the workers engaged in welding works Protective goggles and clothing to workers engaged in stone breaking activities and workers shall be seated at sufficiently safe intervals The Concessionaire shall comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress. The Concessionaire shall ensure that no paint containing lead or lead products is used except in the form of paste or readymade paint. Concessionaire shall provide facemasks to the workers when paint is applied in the form of spray or a surface having dry lead paint when it is rubbed and scrapped. The Concessionaire shall mark 'hard hat' and 'no smoking' and other 'high risk' areas and enforce non-compliance of use of PPE with zero tolerance. | All construction sites | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.4.4.5 | Health and Safety | <ul style="list-style-type: none"> The Concessionaire shall at all times take all reasonable precautions to maintain the health and safety of the Concessionaire's personnel. In collaboration with local health authorities, the Concessionaire shall ensure that medical staff, first aid facilities, sick bay and ambulance service are available at all times at the site. The Concessionaire shall appoint an accident prevention officer at the site, responsible for maintaining safety and protection against accidents. This person shall be qualified for this responsibility, and shall have the authority to issue instructions and take protective measures to prevent accidents. Throughout the execution of the works, the Concessionaire shall provide whatever is required by this person to exercise this responsibility and authority. The Concessionaire shall send, to the Independent Engineer, details of any accident as soon as practicable after its occurrence. The Concessionaire shall maintain records and make reports concerning health, safety and welfare of persons, and damage to property, as the Independent Engineer may reasonably require. | All construction sites and labour camps | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |

| Environmental Issues | | Ref: Clauses | Additional Measures to be Adopted by the Concessionaire | Location ³ | Responsibility | |
|----------------------|------------|---|---|---|---|--|
| | 2.1.4.4.6 | Traffic Safety & Pedestrian Safety | Clause 112. of MoRTH (Arrangement for traffic during construction) | <ul style="list-style-type: none"> Pedestrian Safety shall be ensured. Pedestrian circulation shall be demarcated prior to start & unsafe areas shall be cordoned off. | All along the project corridor | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.4.4.7 | Risk from Electrical Equipment(s) | Factory Act, 1948 – Chapter -5 (Safety) and Factories (Amendment) Act, 1987 | <ul style="list-style-type: none"> No material shall be so stacked or placed as to cause danger or inconvenience to any person or the public. All machines to be used in the construction shall conform to the relevant Indian Standards (IS) codes, shall be free from patent defect, shall be kept in good working order, shall be regularly inspected and properly maintained as per IS provision and to the satisfaction of the Independent Engineer | All construction equipment | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.4.4.8 | Safety during Road Works | Clause 112.4. of MoRTH (Traffic safety) Clause 112.5. of MoRTH (Maintenance and Diversions) IRC:SP:55 (Road signage and markings) | <ul style="list-style-type: none"> The Concessionaire shall provide adequate signage and markings as per the instruction of the Independent Engineer in the construction zones. | All along the project corridor and all haul roads | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.4.4.9 | First Aid | Section 36 (First Aid) of Building and the other Construction Workers(Regulation of Employment and Conditions of Service) Act, 1996 | <ul style="list-style-type: none"> First aid measures shall be provided in the construction zones and labour camps. | All construction sites and labour camps | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.1.4.5. | Cultural Property | | | | |
| | 2.1.4.5.1. | Chance Found Archaeological Property | Ancient Monuments and Archaeological Sites and Remains Rules 1959 Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act 2010 | <ul style="list-style-type: none"> All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on the site are the property of the Government and shall be dealt as per provisions of the relevant legislation. The Concessionaire shall take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. | Along the project corridor | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.2. | Environmental enhancement and special issues | | | | |
| | 2.2.1. | Enhancement measures | | <ul style="list-style-type: none"> Landscaping at junctions to improve aesthetics etc. Rehabilitation of cultural and community properties (Appendix 3) | At suitable locations along the project road | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.2.2. | Rehabilitation/enhancement of Cultural and Religious Properties | Physical Cultural Resources (WB OP/BP 4.11) | <ul style="list-style-type: none"> The architectural elements of the structure shall be conserved/reflected/translated into the design of new structures/ enhancements in accordance with wishes of the community. | At suitable locations along the project road | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |

| Environmental Issues | | Ref: Clauses | Additional Measures to be Adopted by the Concessionaire | Location ³ | Responsibility |
|----------------------|--------|-------------------------------|---|--|--|
| | 2.2.3. | Flora and Chance found Fauna | <ul style="list-style-type: none"> The Concessionaire shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any flora (plant/vegetation) and fauna (animal) including fishing in any water body and hunting of any animal. If any wild animal is found near the construction site at any point of time, the Concessionaire shall acquaint the Independent Engineer and execute the Independent Engineer's instructions for dealing with the same. The Independent Engineer shall report to the nearby forest office (range office) and shall take appropriate steps/ measures in consultation with the forest officials. | Along the project road / forest | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.2.4. | Sensitive receptors | <ul style="list-style-type: none"> Sensitive receptors like schools, hospitals are provided with permanent noise barriers prior to the start of work in order to minimize the dust and noise impacts due to vehicle movement (during / post construction). Their effectiveness needs to be checked during operation phase. Construction activities shall be confined within the present available CoI, regular strict monitoring/supervision shall be done to minimize/control air-noise pollution and abatement of dust particles at minimum level possible using well maintained modern machineries. | Sensitive receptors at: <ul style="list-style-type: none"> Sri SaraswatiVidyalaya, Udalpur (109+000) Community Health Centre, Udalpur (Ch. 109+250) Veer Maharaj Temple (Ch. 117+700) PaleshwarMahadev Temple, Vasai (Ch. 119+600) Govt. Hospital (Animal Husbandary) (Ch.119+825), Sree Ram Foundation (Ch.124+000) | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | | | | <ul style="list-style-type: none"> Umiya Mata Temple (Ch.126+475) Chanakya VidyaMandir (Ch. 127+175) RadhaswamiSatsang Hall (Ch 132+025) Pilvai Primary School (Ch 134+675) Govt. High School, Pilvai (Ch 135+440) KamlaSanskarPeethVidyalaya (Ch 135+850) Anganwadi School(Ch 136+730) St. Xavier School and College (Ch 161+500) Govt Hospital (Ch 162+300) MMI Trust Women's College (162+525) KendriyaVidyalaya (162+825) | |
| | 2.3. | Concessionaire Demobilization | | | |

| Environmental Issues | | | Ref: Clauses | Additional Measures to be Adopted by the Concessionaire | Location ³ | Responsibility |
|---|--------|---|--------------|---|---|--|
| | 2.3.1. | Clearing of Construction of Camps & Restoration | | <ul style="list-style-type: none"> Concessionaire to prepare site restoration plans for approval by the Independent Engineer. The plan shall be implemented by the Concessionaire prior to demobilization. On completion of the works, all temporary structures shall be cleared, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the Concessionaire's expense, to the entire satisfaction of the Independent Engineer. The topsoil removed and conserved earlier shall be spread over the restoration area as per the direction of the Independent Engineer to facilitate the growth of vegetation. Residual topsoil shall be distributed on adjoining/proximate barren/rocky areas as identified by the Independent Engineer in a layer of thickness of 75mm – 150mm. | All Construction Workers' Camps | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 2.3.2. | Redevelopment of Borrow Areas | | <ul style="list-style-type: none"> Redevelopment of borrow areas shall be taken up in accordance with the plans approved by the Independent Engineer | At all borrow area locations suggested for the project. Vasai Fatiya pond (Ch 117+000) Devrasan (Ch 104+000) Near Derol Bridge (Ch.146+500) Sundra-Takari, Vasai (Ch. 117+000) Pilvai (Ch.134+500) SH-55 (Ch. 158+000) SH-55 (Ch. 99+000) | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| 3. OPERATION STAGE (Activities to be Carried Out by the Concessionaire/ Independent Engineer (IE)) | | | | | | |
| | 3.1. | Monitoring and Evaluation of Operational Performance of Environmental Mitigation Measures | | <ul style="list-style-type: none"> The Independent Engineer shall monitor the operational performance of the various mitigation/ enhancement measures carried out as part of the project. Monitoring and performance indicators have been indicated in Environmental Monitoring Plan (Table 5.2). | All along the project corridor | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 3.2. | Maintenance of Drainage | | <ul style="list-style-type: none"> Independent Engineer shall ensure that all drains (side drains and all cross drainages) are periodically cleared especially before monsoon season to facilitate the quick passage of rainwater and avoid flooding without damaging the spurs and check dams erected to stabilize the course and flow of all such drainage channels. Independent Engineer shall ensure that all the sediment/oil and grease traps set up at the water bodies are cleared once in every three months. | At locations where bridge works and culverts are proposed. Bridge locations: Major: Ch 146+525 (Sabarmati river) Minor: Sujalam Suphalem canal at Ch.106+400 and 106+425 Bridges: 13 existing and 13 proposed Culverts: 41 existing and 50 proposed. | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| | 3.3. | Pollution Monitoring | | <ul style="list-style-type: none"> The periodic monitoring of the ambient air quality, noise level, water (both ground and surface water) quality, soil pollution/contamination are to be continued at pre-designated locations as identified in the Environmental Monitoring Plan (Table 5.2) and if necessary, at additional locations for comparative study of pre and post operation data in order to ensure further improvement/modification in similar future works. | All along the project corridor | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |

| Environmental Issues | | | Ref: Clauses | Additional Measures to be Adopted by the Concessionaire | Location ³ | Responsibility |
|----------------------|--|---|--------------|---|---|--|
| 3.4. | | Atmospheric Pollution | | <ul style="list-style-type: none"> Ambient air concentrations of various pollutants shall be monitored as envisaged in the Environmental Monitoring Plan at pre designated locations to compare the levels with the pre-construction data. Additional data at other location may be collected as per any site specific requirement. | All along the project corridor | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| 3.5. | | Noise Pollution | | <ul style="list-style-type: none"> Noise pollution shall be monitored as per Environmental Monitoring Plan at sensitive locations where pre-construction noise data were collected. The functioning of the noise barriers shall be supervised and monitored for further improvement/replication at other affected points if necessary. Signage near sensitive locations shall be maintained and kept clean. Monitoring the effectiveness of the pollution attenuation measures shall be taken up as per Environmental Monitoring Plan (Table 5.2). | All along the project corridor | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| 3.6. | | Soil Erosion and Monitoring of Borrow Areas | | <ul style="list-style-type: none"> Visual monitoring and inspection of soil erosion at borrow areas, quarries (if closed and rehabilitated), embankments and other places expected to be affected, shall be carried to record and monitor the effectiveness of such structures after the completion of project, so as to evaluate the beneficial effects of each type of activity together with the cost involved. | Borrow area at Vasai Fatiya pond (Ch 117+000), Devrasan (Ch 104+000), Near Derol Bridge (Ch.146+500), SundraTakaranVasai (Ch 117+000) Pilvai (Ch.134+500) SH-55 (Ch. 158+000) SH-55 (Ch. 99+000) | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |
| 3.7. | | Road Safety and Maintenance of Assets | | <ul style="list-style-type: none"> Advertisement / hoardings shall 'normally not' be allowed within the Right of Way limits of the project road Regular maintenance and cleaning of assets such as sign boards, bus stops, drains etc. shall be undertaken. | All along the project corridor | (i) Concessionaire (ii) Compliance to these measures shall be confirmed by the IE |

5. IMPLEMENTATION ARRANGEMENTS

5.1 ENVIRONMENTAL MONITORING PLAN

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

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

5.1.1 Monitoring Indicators

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

- Environmental condition indicators to determine efficacy of environmental management measures in control of air, noise, water and soil pollution;
- Environmental management indicators to determine compliance with the suggested environmental management measures.
- Operational performance indicators have also been devised to determine efficacy and utility of the mitigation/enhancement designs proposed

Table 5.1: Environmental Monitoring Indicators

| Sl. No. | Indicator | Details | Stage | Responsibility |
|----------|--|---|--|--|
| A | Environmental Condition Indicators and Monitoring Plan | | | |
| 1 | Air Quality | The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored will be as per the Monitoring Plan prepared (Refer Table 5.2) | Pre-Construction | PIU through DPR Consultants |
| | | | Construction | (i) Concessionaire (ii) Compliance to the air quality monitoring shall be confirmed by the IE |
| | | | Operation | IE |
| 2 | Noise Levels | | Pre-Construction | PIU through DPR Consultants |
| | | | Construction | (i) Concessionaire (ii) Compliance to the noise quality monitoring shall be confirmed by the IE |
| 3 | Water Quality | | Pre-Construction | PIU through DPR Consultants |
| | | Construction | (i) Concessionaire (ii) Compliance to the water quality monitoring shall be confirmed by the IE | |
| 4 | Soil Quality | Pre-Construction | PIU through DPR Consultants | |
| | | Construction | (i) Concessionaire (ii) Compliance to the soil quality monitoring shall be confirmed by the IE | |
| B | Environmental Management Indicators and Monitoring Plan | | | |
| 1 | Tree Cutting | Progress of tree removal marked for cutting is to be reported. | Pre-construction | Forest Department/PIU |
| 2 | Construction Camps | Location of construction camps have to be identified and parameters indicative of environment in the area has to be reported. | Pre-construction | (i) Concessionaire (ii) Compliance to the monitoring shall be confirmed by the IE |
| 3 | Borrow Areas | Location of borrow areas have to be identified and parameters indicative | Pre-construction | (i) Concessionaire (ii) Compliance to the monitoring shall |

| Sl. No. | Indicator | Details | Stage | Responsibility |
|----------|--|--|--------------|--|
| | | of environment in the area has to be reported. | | be confirmed by the IE |
| 4 | Rehabilitation of Borrow Areas | Independent Engineer will undertake site visits to verify that all borrow areas have been rehabilitated in line with the landowner's request and to their full satisfaction. | Construction | (i) Concessionaire (ii) Compliance to the monitoring shall be confirmed by the IE |
| 5 | Tree Transplantation | Progress of measures suggested as part of the Strategy is to be reported | Construction | Forest Department and PIU/R&BD |
| C | Management & Operational Performance Indicators | | | |
| 1 | Survival Rate of Trees | The number of trees surviving during each visit will be compared with the number of trees transplanted | Completion | Forest Department and PIU/R&BD |

44. For each of the environmental condition indicator, the monitoring plan specifies the parameters to be monitored, location of the monitoring sites (Appendix 5), frequency and duration of monitoring. The monitoring plan also specifies the applicable standards, implementation and supervising responsibilities. The monitoring plan for environmental condition indicators of the project in construction and operation stages is presented in Table 5.2.

Table 5.2: Environmental Monitoring Plan

| Attribute | Project Stage | Parameter | Special Guidance | Standards | Frequency | Duration | Location | Implementation |
|---|--|--|---|---|--|---|---|--|
| Air | Construction | SO ₂ , NO _x , PM ₁₀ , PM _{2.5} , CO | High volume sampler to be located 50m from the plant in the Downwind direction. Use method specified by CPCB for analysis | Air (prevention and Control of Pollution) Rules, CPCB, 2009 | Three seasons per year (till the project construction period) | 24 hours Sampling | Along the road Hot mix / batching plant | (i) Concessionaire (ii) Compliance to the air quality monitoring shall be confirmed by the IE |
| | Three seasons per year for every 3 rd year of concession period | | | | Along the road | | | |
| Noise | Construction | Noise levels on dB (A) scale | Equivalent noise levels using an integrated noise level meter kept at a distance of 15 from edge of pavement Equivalent noise levels using an integrated noise level meter kept at a distance of 15 from edge of pavement | MoEF Noise Rules, 2000 | Three seasons per year (till the project construction period) | Leq in dB(A) of day time and night time | Along the road Hot mix / batching plant | (i) Concessionaire (ii) Compliance to the noise quality monitoring shall be confirmed by the IE |
| | Three seasons per year for every 3 rd year of concession period | | | | Along the road | | | |
| Water | Construction | All essential characteristics and some of desirable characteristics as decided by the Environmental Specialist of the IE and PIU | Grab sample collected from source and Analyse as per Standard Methods for Examination of Water and Wastewater | Indian Standards for Inland Surface Waters (IS: 2296, 1982) | Three seasons per year (till the project construction period) | Grab Sampling | Along the road Surface water sources | (i) Concessionaire (ii) Compliance to the water quality monitoring shall be confirmed by the IE |
| Soil | Construction | Monitoring of Pb, SAR and Oil & Grease | Sample of soil collected to acidified and analysed using absorption Spectrophotometer | Threshold for each contaminant set by IRIS database of USEPA until national standards are promulgated | Once in a year(till the project construction period) | Grab Sampling | Along the road Hot mix / batching plant | (i) Concessionaire (ii) Compliance to the soil quality monitoring shall be confirmed by the IE |
| Borrow area | Pre-construction | Suitability of the material as per IS 2720 | - | IS 2720 | Once | Once | Borrow area location | (i) Concessionaire (ii) Compliance to the rehabilitation measures shall be confirmed by the IE |
| Rehabilitation of Borrow Areas | Construction | As per Guidelines | Visual Observation | - | Once in a month | - | | |
| HIV/ AIDS Prevention Plan/ Measures (HPP) | Construction | Awareness campaign | - | - | Annual | - | Construction and Labour Camp sites | (i) Concessionaire (ii) Compliance to the HPP measures shall be confirmed by the IE/PIU/R&BD |
| | | HIV/ AIDS Screening of 100% construction personnel's | | | Within one month of mobilisation and every quarter during construction | | | |
| | | IEC materials distribution | | | Quarterly | | | |
| | | Condom Distribution | | | Once a month | | | |
| Tree Transplantation | Construction | Trees within 30 to 90cm girth size | Tree Transplantation shall be carried out using tree transplantation machine operated by Forest Department | | Once | - | As per Design | Forest Department/ R&BD/PIU |
| | Operation | | The number of trees surviving during each visit will be compared with the number of trees transplanted | | Quarterly | - | Areas where transplantation is being done | Forest Department/ R&BD/PIU |

4Parameters to be monitored for Operation stage is same as Construction stage

5.2 REPORTING SYSTEM

45. Reporting system for the suggested monitoring program operates at two levels as:

- Reporting for environmental condition indicators and environmental management indicators (except tree cutting indicator)
- Reporting for operational performance indicators at the PIU level

46. Concessionaire will operate the reporting system for environmental condition and environmental management indicators (except tree cutting). The Environmental Management Unit (EMU) of PIU will operate the reporting system for environmental management tree cutting indicator and operation performance indicators. The PIU will set the targets for each activity envisaged in the EMP beforehand and all reports will be against these targets.

47. Concessionaire will report to the Independent Engineer on the progress of the implementation of environmental conditions and management measures as per the EMP. The Independent Engineer will in turn report to the PIU on a quarterly basis. Reporting formats have been prepared, which will form the basis of monitoring, by the Independent Engineer and/or the Environmental Cell as required and presented as Appendix 4.

Table 5.3: Summary details of Reporting

| Format No. | Item | Stage | Concessionaire | Independent Engineer | | Project Implementation Unit (PIU) |
|------------|---|-------------------|--|----------------------|------------------|--------------------------------------|
| | | | Implementation & Reporting to Independent Engineer | Supervision | Reporting to PIU | Oversee/ Field Compliance Monitoring |
| EM 1 | Identification of Disposal Locations | Pre-Construction | One Time | One Time | One Time | One Time |
| EM 2 | Setting up of Construction Camp | Pre-Construction | One Time | One Time | One Time | One Time |
| EM 3 | Borrow Area Identification | Pre-Construction | One Time | One Time | One Time | One Time |
| EM 4 | Tree Cutting | Pre-Construction | - | - | - | Monthly |
| EM 5 | Tree Transplantation | Construction | - | Monthly | - | Quarterly |
| EM 6 | Top Soil Monitoring | Construction | Quarterly | Continuous | Quarterly | Quarterly |
| EM 7 | Status Regarding Rehabilitation of Borrow Areas | Construction | - | - | - | Half Yearly |
| EM 8 | Construction Safety | Construction | Quarterly | Continuous | Quarterly | Quarterly |
| EC 1 | Pollution Monitoring | Construction | As Per Monitoring Plan | Quarterly | Quarterly | Quarterly |
| EC 2 | Pollution Monitoring | Post Construction | As Per Monitoring Plan | Quarterly | Quarterly | Quarterly |
| OPI | Survival Rate of Trees | Operation | - | Quarterly | - | Quarterly |

48. In addition to these formats, to ensure that the environmental provisions are included at every activity of the implementation by the Concessionaire, it is suggested that the approval of the environmental personnel of the Independent Engineer is required in the request for application to proceed or other similar reporting formats used by the Concessionaire. These will not only ensure that the environmental provisions are addressed but also link the satisfactory compliance to environmental procedures prior to approval of the Annuity Payment Due by the Independent Engineer. The activities by the Concessionaire that can impact the environment will be identified based on discussions between the Environmental Specialist of the PIU, Team Leader of the Independent Engineer and the Environmental personnel of the Independent Engineer. The decisions will be communicated to the Concessionaire prior to the start of the construction activities.

5.3 NONCONFORMITY TO EMP

49. The Concessionaire shall implement all mitigation measures for which responsibility is assigned to him as stipulated in the EMP Report.

During construction: if the concessionaire fails to implement the Project Highway in accordance with the EMP and the statutory requirements, then it shall attract the damage/s as detailed below:

- i. All lapses in obtaining clearances / permissions under statutory regulations and violations of any regulations with regard to eco-sensitive areas shall be treated as a major lapse.
- ii. Any complaints of public, within the scope of the Concessionaire, formally registered with the Independent Engineer (IE), R & BD or with the GoG and communicated to the Concessionaire, which is not properly addressed within the time period intimated by the Independent Engineer (IE) / R & BD, GoG shall be treated as a major lapse.
- iii. Non-conformity to any of the mitigation measures stipulated in the EMP Report (other than stated above) shall be considered as a minor lapse.
- iv. On observing any lapses, Independent Engineer (IE) shall issue a notice to the Concessionaire, to rectify the same.
- v. Any minor lapse for which notice was issued and not rectified, first and second reminders shall be given after ten days from the original notice date and first reminder date respectively. Any minor lapse, which is not rectified, shall be treated as a major lapse from the date of issuing the second reminder.
- vi. If a major lapse is not rectified upon receiving the notice Independent Engineer (IE) shall invoke reduction, in the subsequent interim payment certificate.
- vii. For major lapses, 10% of the interim payment certificate will be withheld, subject to a maximum limit of about 0.5 % of contract Value.
- viii. If the lapse is not rectified within one month after withholding the payment, the amount withheld shall be forfeited.

During Operation and Maintenance: If the concessionaire fails to implement the Project Highway in accordance with the EMP and the statutory requirements, then it shall attract the damage clause as detailed below:

Reduction in Annuity on account of non-conformance to Environmental Management and mitigation measures as per the EMP and statutory requirements. If in an Annuity Payment Period, the Concessionaire fails to implement the Project Highway in accordance with the EMP and the statutory requirements, then it shall be liable for payment of Damages. The aggregate sum of such Damages in an Annuity Payment Period shall be computed and certified by the Independent Engineer and aggregate sums of such Damages shall be reduced from its Annuity payment for the respective Annuity Payment Period.

50. During Operation and Maintenance: If the Concessionaire fails to adhere to EMP and statutory requirements and fails to cure within a reasonable period as instructed by the Independent Engineer, it shall be deemed to be in breach of this Agreement and the Authority shall be entitled to recover Damages to be calculated and paid for each day of delay until the breach is cured, at the higher of (a) 0.5% (zero point five percent) of Average Daily Annuity Fee, and (b) 0.1% (zero point one percent) of the cost of such repair or rectification as estimated by the Independent Engineer. Recovery of such Damages shall be without prejudice to the rights of the Authority under this Agreement, including the right of Termination thereof.

Institutional Setup

51. During implementation, the Concessionaire, Independent Engineer and PIU will be collectively responsible for ensuring effective implementation of the provisions of the EMP and to comply with all statutory and legal requirements and procedures applicable for the project. The institutional responsibilities for EMP implementation are presented in Table 5.4.

Table 5.4: Institutional Responsibilities

| System | Designation | Responsibilities |
|---------------------------------------|--|---|
| Coordinating / Facilitating Agency | Chief Engineer (WB), R&BD | <ul style="list-style-type: none"> • Overview of the project implementation • Ensure timely budget for the EMP • Coordination with different state level committee, to obtain Regulatory Clearances • Participate in state level meetings • Monthly review of the progress. |
| | Superintending Engineer PIU | <ul style="list-style-type: none"> • Overall responsible for EMP implementation • Reporting to various stakeholders (World Bank, Regulatory bodies) on status of EMP implementation • Coordination with PIU Staff (Environmental officer). • Responsible for obtaining Regulatory Clearances • Review of the progress made by Concessionaires • Ensure that BOQ items mentioned in EMP are executed as per Contract provisions. |
| | Environment and R&R Specialist (PIU) | <ul style="list-style-type: none"> • Assisting SE in overall implementation of EMP • Review of periodic reports on EMP implementation and advising SE in taking corrective measure. • Conducting periodic field inspection of EMP implementation • Assisting SE to reporting various stakeholders (World Bank, Regulatory bodies) on status of EMP implementation • Preparing environmental training program and conducting the same for field officers and engineers of Concessionaire |
| Implementing/ Monitoring Agency | Independent Engineer (IE) | <ul style="list-style-type: none"> • Shall confirm the compliance of the Environmental Management measures executed by the Concessionaire during the project construction and operation (concession period) • Review progress reports and periodic reporting to PIU about the status of EMP implementation • Work in close coordination with ERRS (PIU) and Concessionaire |
| | RAP implementation NGO | <ul style="list-style-type: none"> • Conducting awareness campaign for all construction personnel (including labourers, supervisors, engineers and consultants) about HIV/AIDS/STDs in the construction and labour camps. • Facilitating the medical testing/ routine check-up for labours as suggested in the HPP |
| Concessionaire | Environmental Manager of Concessionaire | <ul style="list-style-type: none"> • Responsible for ensuring the implementation of EMP as per provision in the document. • Directly reporting to the Project Manager of the Concessionaire • Discussing various environmental/social issues and environmental/social mitigation, enhancement and monitoring actions with all concerned directly or indirectly • Assisting his project manager to ensure social and environmentally sound and safe construction practices • Conducting periodic environmental and safety training for Concessionaire's engineers, supervisors and workers along with sensitization on social issues that may be arising during the construction stage of the project • Assisting the PIU on various environmental monitoring and control activities |

| System | Designation | Responsibilities |
|--------|---------------------|---|
| | | including pollution monitoring; and <ul style="list-style-type: none"> • Preparing and submitting monthly reports to PIU on status of implementation safeguard measures |
| NGO | Facilitating agency | <ul style="list-style-type: none"> • Coordinate with the Concessionaire for the purpose of implementing the proposed green Initiatives |

5.1 GOOD ENVIRONMENTAL CONSTRUCTION GUIDELINES

52. Comprehensive environmental construction guidelines has been prepared and presented in the Appendix 6. The purpose of the guideline is to guide the Concessionaire and the project proponent to mitigate the environmental issues that are like to arise during the project construction and operation.

Table 5.5: Guideline for Good Environmental Practices

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

6. ENVIRONMENTAL MANAGEMENT BUDGET

53. Budgetary estimates for environmental management in the project include all items envisaged as part of the EMP. The environment budget includes provisions for various environmental management measures (other than measures considered under good engineering practices) and the environmental monitoring costs. Budgetary provisions for the project are presented in Table 0.1 and Bill of Quantities (BoQ) is provided in Appendix 7.

Table 0.1: Budgetary Provisions for Environmental Management Measures

| Sl. No. | Item | Unit | Rate (in INR) | Quantity | Cost (in INR) |
|----------|---|----------------|---|----------|---------------|
| A | CONSTRUCTION PHASE | | | | |
| 1 | Site Clearance | | | | |
| 1.1 | Disposal of unserviceable as well serviceable material with all leads and lifts beyond the ROW | Cum | Bill no 2, item no 2.02 | | |
| 1.2 | The 30 cm top layer of disposal pit shall be provided with good earth, suitable for development of vegetation/plantation. All work shall be carried out as per specifications 301.3.2 of MoRTH and approval of the Engineer in Charge | Cum | Provision shall be made by the Concessionaire | | |
| 1.3 | Regular water sprinkling (at least 4 times) per day at all construction sites for suppression of visible dust levels. <i>Note: This item is to be operated after the completion of earthwork to suppress the visible dust levels. Cost of watering during compaction of earthwork is deemed to be already covered under civil works.</i> | Km | Provision shall be made by the Concessionaire | | |
| 2 | Construction near water bodies | | | | |
| 2.1 | Construction of silt traps at the discharge points of channels into to fresh water bodies across the project road as indicated in the Clause 111.4 and 111.18 | m | Provision shall be made by the Concessionaire | | |
| 2.2 | Providing Oil Interceptors at the fuel/oil storage camps or Construction camps. | Nos. | Provision shall be made by the Concessionaire | | |
| 2.3 | Providing and Construction of Rain water Harvesting complete as per drawings and Technical Specification section 300, 1300, 1500, 1700 or as directed by the Engineer. | Nos. | Bill no.8, item 8.25 | | |
| 3 | Worker Safety | | | | |
| 3.1 | Providing Personal Protective Equipment to the labors during the construction phase of the project | Nos. | Provision shall be made by the Concessionaire | | |
| 4 | Monitoring of Environmental Attributes during Construction Activity | | | | |
| 4.1 | Air Quality | | | | |
| 4.1.1 | Monitoring of Air Quality near Hot mix plants | No. of Samples | 7,500.00 | 24.0 | 180,000.00 |
| 4.1.2 | Monitoring of Air Quality at Critical Locations | No. of Samples | 7,500.00 | 18.0 | 135,000.00 |
| 4.2 | Noise Levels | | | | |
| 4.2.1 | Monitoring of Noise Level at Equipment Yards | No. of Samples | 3,000.00 | 18.0 | 54,000.00 |
| 4.2.2 | Monitoring of Noise Levels at Critical Locations | No. of Samples | 3,000.00 | 18.0 | 54,000.00 |

| Sl. No. | Item | Unit | Rate (in INR) | Quantity | Cost (in INR) |
|--|--|----------------|---------------------------------|----------|----------------------|
| 4.3 | Water Quality | No. of Samples | 6,000.00 | 36.0 | 216,000.00 |
| 4.4 | Soil Quality | No. of Samples | 6,000.00 | 6.0 | 36,000.00 |
| 5 | Enhancement Measures | | | | |
| 5.1 | Paleshwar Mahadev Temple (Ch 119+600) | LS | | | 19,275.00 |
| 5.2 | Chikotar Mata Temple (Ch 136+050) | LS | | | 74,542.00 |
| 6 | HIV/ AIDS Prevention measures (considering 2 camps with 400 employees each) | | | | |
| 6.1 | IEC materials - printing, publishing | | 3,000.00 | 48.0 | 144,000.00 |
| 6.2 | Healthcare clinic | | 30,000.00 | 16.0 | 480,000.00 |
| 6.3 | Condom vending machines | | 15,000.00 | 6.0 | 90,000.00 |
| 6.4 | Condom supplies | | 5,000.00 | 48.0 | 240,000.00 |
| 6.5 | Testing | | 1,500.00 | 800.0 | 1,200,000.00 |
| 6.6 | Signages and hoardings | | 15,000.00 | 30.0 | 450,000.00 |
| 7 | Green Initiative Budget | | | | |
| 7.1 | Tree transplantation (Transplanting young trees within 30 to 90cm girth size) | | 8,000.00 | 516.0 | 4,128,000.00 |
| 7.2 | Solid Waste Management (Provision of Bins at 10 location) | | 20,000.00 | 10.0 | 200,000.00 |
| 7.3 | Facilitating agency remuneration for implementing the green initiation (training, awareness campaign, monitoring etc.) | Per year | 1,200,000.00 | 5.0 | 6,000,000.00 |
| 7.4 | Vertical creeper plantation (landscaping) for the green highway stretch | Nr | 800.00 | 4000.0 | 3,200,000.00 |
| 7.5 | Solar Street Light | | Bill no 8, item no 8.35 | | |
| 7.6 | Cattle crossing with necessary signage's | | Bill no 8, item no 8.02 | | |
| 7.7 | Warm Mix Asphalt for 2km stretch | | Bill no 5, item no 5.06b, 5.07b | | |
| 7.8 | Landscaping (Ch 161+400 to 163+350) | | Bill no 8, item no 8.20 | | |
| Environmental Budget During Construction Phase | | | | | 16,900,817.00 |
| B | OPERATION PHASE | | | | |
| 1 | Monitoring of Air Quality at Critical Locations | No. of Samples | 7,500.00 | 90.0 | 675,000.00 |
| 2 | Monitoring of Noise Levels at Critical Locations | No. of Samples | 3,000.00 | 90.0 | 270,000.00 |
| 3 | Landscaping maintenance cost | | 60,000.00 | 15.0 | 900,000.00 |
| Environmental Budget During Operation Phase | | | | | 1,845,000.00 |
| Sub Total (A+B) | | | | | 18,745,817.00 |
| Grand Total INR. (Environmental Budget +3% contingency) | | | | | 19,308,192.00 |

**Project Preparatory Works Consultancy Services for
Gujarat State Highway Project - II**

**Volume-IV A:
Appendices to EMP**

MINISTRY OF ENVIRONMENT AND FORESTS
NOTIFICATION

New Delhi, the 4th April, 2011

S.O. 695(E).— Whereas by notification of the Government of India in the Ministry of Environment and Forests vide number S.O. 1533(E), dated the 14th September, 2006 issued under sub-section (1) and clause (v) of sub-section (2) of section (3) of the Environment (Protection) Act, 1986 read with clause (d) of sub-rule (3) of rule 5 of the Environment (Protection) Rules, 1986, the Central Government directed that on or from the dates of its publication, the required construction of new projects or activities or the expansion or modernization of existing projects or activities listed in the Schedule to the said notification entailing the capacity addition with change in process and or technology shall be undertaken in any part of India only after prior environmental clearance from the Central Government or as the case may be, by the State level Environment Impact Assessment Authority, duly constituted by the Central Government under sub-section (3) of section 3 of the said Act in accordance with the procedure specified therein;

And whereas, it has been decided to provide clarification with regard to the term "built up area" used in the said Notification and also to make various paras of the Notification mutually consistent and to restore the unintentional changes, which got into the Notification while making amendment vide S.O. 3067 (E) dated 1st December, 2009, in particular the entry against item no. 7(f) in the schedule to the EIA Notification, 2006 relating to highway projects and for this purpose to issue suitable amendments in the said Notification.

And whereas, clause (a) of sub-rule (3) of rule 5 of the said Environment (Protection) Rules provides that, whenever the Central Government considers that

prohibition or restrictions of any industry or carrying on any processes or operation in any area should be imposed, it shall give notice of its intention to do so;

And whereas, sub-rule (4) of rule 5 of the said Environment (Protection) Rules provides that, notwithstanding anything contained in sub-rule (3), whenever it appears to the Central Government that it is in public interest to do so, it may dispense with the requirement of notice under clause (a) of sub-rule (3);

Now therefore, in exercise of the powers conferred by sub-section (1) and clause (v) of sub-section (2) of section 3 of the said Environment (Protection) Act, read with clause (d) of sub-rule (3) of rule 5 of the said Environment (Protection) Rules, the Central Government hereby makes the following amendments in the said Notification, namely:-

In the said notification, -

(I) In para 6, for the existing words "An application seeking prior environmental clearance in all cases shall be made", the following words shall be substituted, namely:-

"An application seeking prior environmental clearance in all cases shall be made by the project proponent".

(II) In para 7, in sub-para 7 in clause (i), sub para II, stage (2) – scoping, sub para (i), in the last sentence, for the words "activities listed as Category 'B' in item 8 of the schedule (Construction / Township / Commercial Complexes / Housing)", the following words shall be substituted, namely:-

"Activities listed as Category 'B' in item 8(a) of the schedule (building and construction projects)".

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(III) In the Schedule, -**(i) against item 1(a), -**

in column (5), for the entries, the following entries shall be substituted, namely:-

"General conditions shall apply.

Note:

- (i) Prior environmental clearance is as well required at the stage of renewal of mine lease for which application should be made up to one year prior to date of renewal.
- (ii) Mineral prospecting is exempted."

(ii) against item 7(f), -

in column (4), for the entry "(i) All State Highway Projects; and" the following entry shall be substituted, namely:-

"(i) All New State Highway Projects".

(iii) against item 8(a), -

in column (5), for the entry, the following entry shall be substituted, namely:-

"The built up area for the purpose of this Notification is defined as "the built up or covered area on all the floors put together including basement(s) and other service areas, which are proposed in the building / construction projects"."

(IV) In Appendix V, for para 3, the following para shall be substituted, namely:-

"3. where a public consultation is not mandatory, the appraisal shall be made on the basis of prescribed application Form-1 and EIA report, in the case of all projects and activities other than item 8 of the schedule. In the case of item 8 of the schedule, considering its unique project cycle, the EAC or SEAC concerned shall appraise projects or activities on the basis of Form-1, Form-1A, conceptual plan and the EIA report [required only for projects listed under 8(b)] and make recommendations on the project regarding grant of environmental clearance or otherwise and also stipulate the conditions for environmental clearance".

[F. No. 3-101/2010-IA. III]

Dr. NALINI BHAT, Scientist 'G'

Note: The principal rules were published in the Gazette of India, Extraordinary, Part II, Section 3, Sub-section (ii) vide notification number S.O. 1533(E), dated the 14th September, 2006 and amended vide S.O. 1737(E), dated the 11th October, 2007 and S.O. No. 3067(E) dated 1st December, 2009.



GOVERNMENT OF GUJARAT

Forest & Environment Department,

14/8, Sardar Bhavan, Sachivalaya, Gandhinagar-382010.

Ph.079-23251074 Fax 079-23252156

No.FCA-1010(7-30)/SF-37/F

Date: 21 AUG 2010

Subject: Diversion of 13.74 ha. of Protected forest land for widening and strengthening SH-55, Mehsana-Visnagar-Vijapur-Himatnagar road from Km. 147/000 to 163/650 in favour of R. & B. Division in Sabarkantha District of Gujarat.

- Ref.** (1) GOI, MOEF, Bhopal's Letter No. 6-GJD 013/2010-BHO/1391 dated 20/07/2010.
(2) Nodal officer (FCA) Gujarat's note on Single file No. FCA-1010(7-30)/SF-37/F dated 8/07/2010.

MEMORANDUM:-

The GOI, MOEF, Bhopal has given formal approval for Diversion of 13.74 ha. of Protected forest land for widening and strengthening SH-55, Mehsana-Visnagar-Vijapur-Himatnagar road from Km. 147/000 to 163/650 in favour of R. & B. Division in Sabarkantha District of Gujarat vide their letter dated 20/07/2010 referred at Sr. (1) above.

The undersigned is pleased to convey the formal approval of the Government under section 2 of the Forest (Conservation) Act, 1980, subject to the following conditions:-

1. The legal status of the forest land shall remain unchanged.
2. Compensatory afforestation shall be taken up over 28.00 ha. Degraded forest land, in Survey No. 22/4 pt, Village-Bhempoda, Ta.-Malpur, Dist. Sabarkantha, at the cost of User Agency, within 2 years from the date of the transfer of forest land to the User Agency.
3. All the funds received from the User Agency under the project shall be transferred to the Ad-hoc Compensatory Afforestation Fund Management & Planning Agency (CAMPA) in A/c No. CA 1583 of Corporation Bank, Block -11, CGO Complex, Phase-I, Lodi Road, New Delhi - 110003.

4. The State Government shall ensure tree plantation (strip) on both side of the road, at the cost of User Agency. The State Government will furnish a compliance report with respect to completion of plantation works within one year of issue of this approval.
5. All other conditions under different rules, regulations and guidelines including environmental clearance and the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act-2006, shall be complied with before transfer of forest land.
6. The forest land shall not be used for any purpose other than that is specified in the project proposal.
7. Any other condition imposed by the State Government.

By order and in the name of the Governor of Gujarat.

P. M. Christian

(P. M. Christian)

Deputy Secretary to the Government
Forest & Environment Department.

Copy to:-

- 1 The Director(FC), Ministry of Environment & Forests, Government of India, Paryavaran Bhavan, CGO Complex, Lodhi Road, New Delhi.
- 2 The Chief Conservator of Forests(Central), Ministry of Environment & Forests, Regional Office, Western region, BHOPAL-462016(M.P.)
- 3 The Chief Conservator of Forests and Nodal Officer(FCA), Pr. Chief Conservator of Forest's office. Block No.14, Dr. Jivraj Mehta Bhavan, Gandhinagar. Their Single file No.FCA-1010(7-30)/SF-37/F is returned herewith with memorandum dated2...1...AUG 2010
- 4 The Dy.Conservator of Forests, Extention Division North, Himatnagar.
- ✓ 5 The Executive Engineer, Sabarkantha R & B Division, Himatnagar.
- 6 The Select file.

No. PB-Hmt. 7549
Dt-

7-9-10

| | |
|----------|---------|
| 21/10/10 | PB |
| | |
| | |
| | |
| | 921209 |
| | 2/10/10 |

copy to the D.E.E. R & B Himatnagar for information and necessary action.

copy to AB-Hmt for information

N. A.
Executive Engineer
R. & B. Div. Himatnagar.



सत्यमेव जयते

भारत सरकार
GOVERNMENT OF INDIA
पर्यावरण एवं वन मंत्रालय
MINISTRY OF ENVIRONMENT & FORESTS

7-51/10

7-5H/10

क्षेत्रीय कार्यालय, पश्चिम क्षेत्र,
Regional Office, Western Region,
"केन्द्रीय पर्यावरण भवन"

"Kendriya Paryavaran Bhavan
लिन्क रोड नं०-३, Link Road No. 3
E-5, रविशंकर नगर/Ravi Shankar Nagar,
भोपाल (म०प्र०)/Bhopal-462016 (M.P.)
फोन- 2466525, 2463102, 2465496
अणुडाक /E-mail: rccfbhopal@gmail.com

No: 6-GJD012/2011-BHO/3992

To,

The Principal Secretary,
Govt. of Gujarat,
Forest and Environment Department,
14/8, Sardar Bhawan,
Sachivalaya, Gandhinagar.

Dt-14-11-2011

Sub: Diversion of 4.305 ha protected forest land for road widening S.H.No.55, Mehsana-Vijapur-Himatnagar road Km 127/00 to 135/200 in favour of Executive Engineer, Road & Building Division, Mehsana District of Gujarat.

Sir,

I am directed to invite a reference to your letter No. FCA/1011/7-51/(10)/S.F-48 dated 04/05/2011 and even dated 09/09/2011, on the above mentioned subject seeking prior approval of the Central Government under section - 2 of the Forest (Conservation) Act, 1980.

After careful consideration of the proposal of the State Government, the Central Government, hereby agrees in principle for diversion of 4.305 ha protected forest land for road widening S.H.No.55, Mehsana-Vijapur-Himatnagar road Km 127/00 to 135/200 in favour of Executive Engineer, Road & Building Division, Mehsana District, subject to the following conditions:-

- 1.. The legal status of the forest land shall remain unchanged.
- 2.. Compensatory Afforestation shall be taken up over 8.610 ha degraded forest land in Survey No. 942/1 Pt, Village-Anodia, Tal.Mansa, District-Gandhinagar, at the cost of the user agency.
- 3.. The cost of compensatory afforestation at the prevailing wage rates shall be deposited in advance with the Forest department by the project authority.

Contd.....2

अधिक अग्र मुख्य वन संरक्षक
जमीन
गुजरात राज्य, गंधीनगर
आवक क्रमांक..... 960
तारीख..... 11.12.2011
..... T-29

T-29
21/11
23-11-11

02/3/11

- 13.. The user agency will not collect any toll tax from the Forest Department vehicles.
- 14.. The designing of culverts/bridges, if any, over the natural streams/rivers/canals should be done in such a manner that it does not hamper the natural course of water, does not give rise to water logging, and also does not hamper movement of wild animals.
- 15.. All other conditions under different rules, regulations and guidelines, as may be required, including the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 shall be complied with before transfer of forest land.
16. The forest land shall not be used for any purpose other than that specified in the project proposal.

After receipt of the compliance report on the fulfillment of condition Nos. 3, 4, 5 6(b) & 8 from the State Government, this office will consider the issuance of formal approval in this regard under section 2 of the Forest (Conservation) Act, 1980.


The order for diversion of forest land to user agency should not be issued by the State Government till formal approval order is issued by this office.

Yours faithfully,

(Pradeep Vasudva)
Conservator of Forests(C)

Copy to :-

1. The Director(FC), Ministry of Environment and Forests, Paryavaran Bhawan, CGO Complex, Lodi Road, New Delhi - 110003.
2. The Chief Conservator of Forests and Nodal Officer, Govt. of Gujarat, Dr. Jivraj Mehta Bhawan, Block 14, Old Sachivalaya, Gandhinagar - 382010.
- 3.. The Dy Conservator of Forests, Gandhinagar Forest Division, District Gandhiagar, Gujarat.
- 4.. The Executive Engineer, Road and Building Division Mehsana, District Mehsana, Gujarat.
- 5.. Order File.


(Pradeep Vasudeva)
Conservator of Forests(C)






APPENDIX 3: ENHANCEMENT MEASURES

APPENDIX 3:
ENHANCEMENT MEASURES

SPECIAL NOTES:

- THIS TEMPLE IS ONE OF THE ANCIENT TEMPLES DEVELOPED BY THE KING AROUND 1200 YEARS BACK.
- AROUND 5000 DEVOTEES VISIT THE TEMPLE DURING FESTIVALS SEASON.
- THE TEMPLE HAS ALL THE BASIC NEEDS OF THE DEVOTEES ALREADY AVAILABLE AND A NEW ENTRANCE GATE IS ALSO UNDER CONSTRUCTION.
- SOME TREES ALONG THE BOUNDARY WALL INSIDE THE PRECINCT ARE PROVIDED AS SUGGESTED BY THE COMMUNITY.

LEGEND

-  EXISTING TREES
-  PROPOSED TREES
-  EXISTING BOUNDARY WALL
-  EXISTING PAVED PATHWAY
-  ENCROACHMENT



NOTES:

- DIMENSIONS ARE IN M UNLESS OTHERWISE SPECIFIED.
- SPECIFIC CHANGES IF ANY, TO BE MADE ONLY ON APPROVAL OF SUPERVISION CONSULTANT.



| | |
|-------------|-----------------------------|
| Drawing No. | 8.22 |
| Drawing | Proposed Enhancement |
| Kms. | 119+600 |
| RF | 1:400 |



| ENHANCEMENT FOR STATE HIGHWAY 55 (MEHSANA TO HIMATNAGAR) | | | | | |
|---|------------------|----------------|----------------|-----------|--|
| Designed By: | Drawn By: | Checked By: | Approved By: | Date: | |
| Ar. Ashish Batra | Ar. Ashish Batra | k.Pushpanathan | R. Vishvnathan | June 2012 | |

GUJARAT STATE HIGHWAYS PROJECT (GSHP-II)

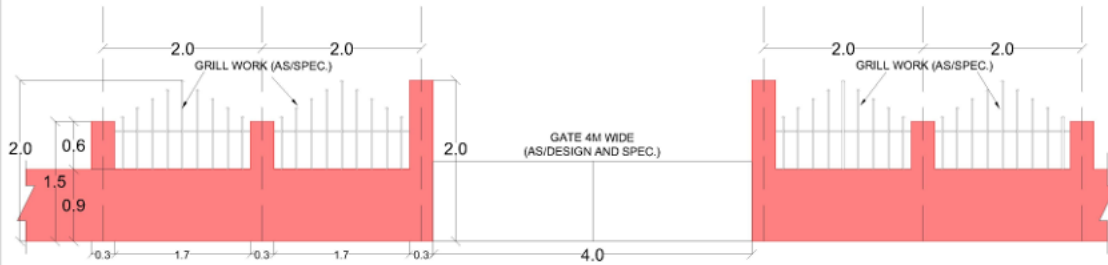
 **LEA Associates South Asia Pvt. Ltd.**
 B-1/E-27, 11nd Floor, Mohan Cooperative Industrial Estate,
 Mathura Road, New Delhi-110044
 91-011-8973950-55

SPECIAL NOTES:

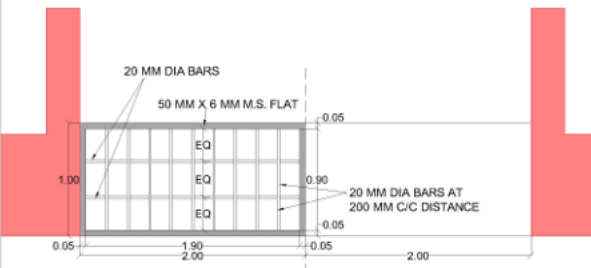
- THIS TEMPLE IS AROUND 100 YEARS OLD AND VERY FAMOUS IN THE NEARBY AREAS.
- AROUND 5000-6000 DEVOTEES VISIT THE TEMPLE DURING FESTIVALS SEASON.
- A BOUNDARY WALL FOR PROTECTION FROM THE VEHICULAR TRAFFIC, PAVED PATHWAY, SITTING BENCHES WITH SOME TREES ARE PROVIDED AS SUGGESTED BY THE COMMUNITY.

LEGEND

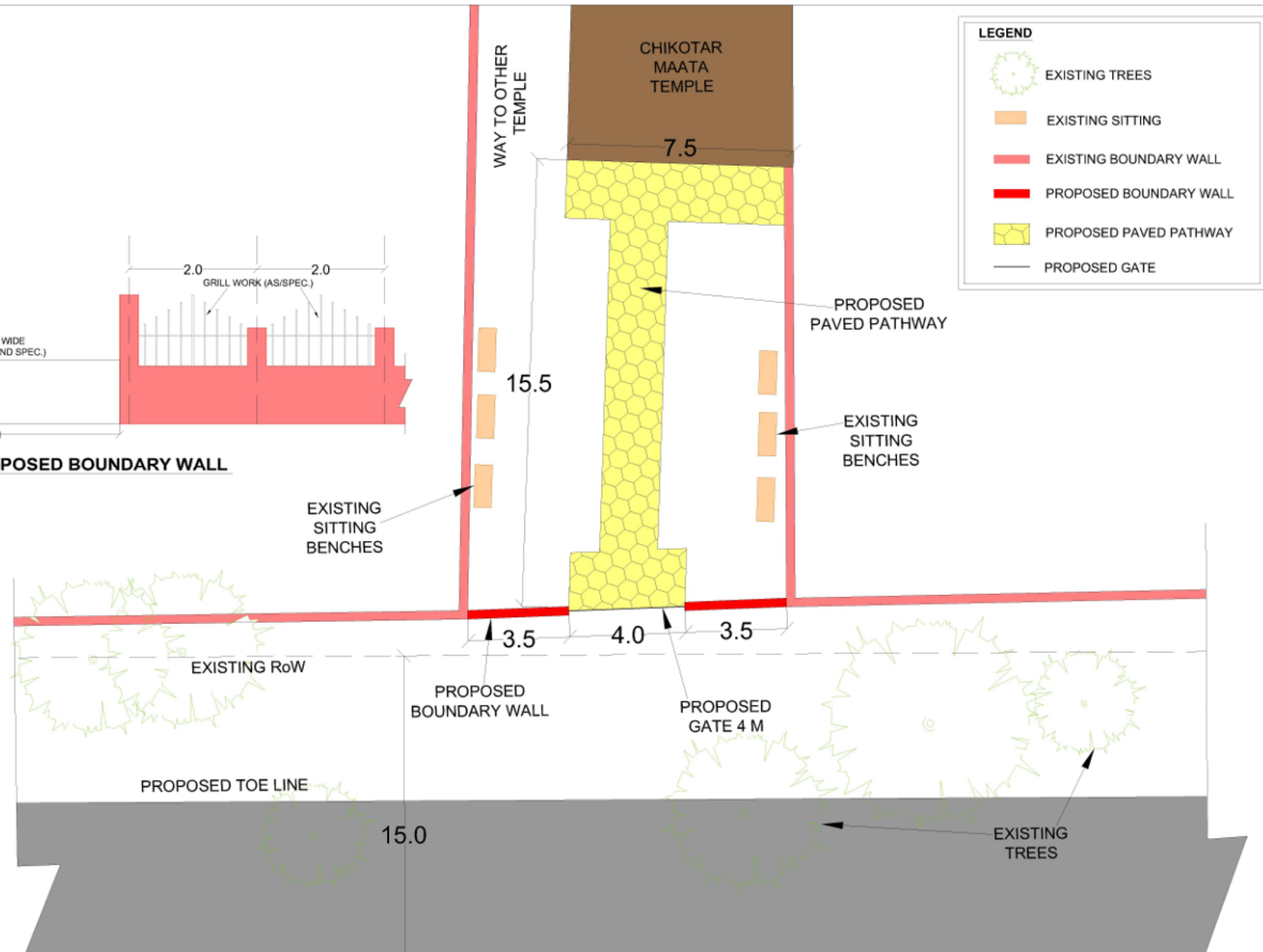
-  EXISTING TREES
-  EXISTING SITTING
-  EXISTING BOUNDARY WALL
-  PROPOSED BOUNDARY WALL
-  PROPOSED PAVED PATHWAY
-  PROPOSED GATE



ELEVATION OF PROPOSED BOUNDARY WALL
SCALE-N.T.S



PROPOSED GATE
SCALE-N.T.S



NOTES:

- DIMENSIONS ARE IN M UNLESS OTHERWISE SPECIFIED.
- SPECIFIC CHANGES IF ANY, TO BE MADE ONLY ON APPROVAL OF SUPERVISION CONSULTANT.



| | |
|-------------|-----------------------------|
| Drawing No. | 8.23 |
| Drawing | Proposed Enhancement |
| Kms. | 136+050 |
| RF | 1:150 |



ENHANCEMENT FOR STATE HIGHWAY 55
(MEHSANA TO HIMATNAGAR)

| | | | | |
|------------------|------------------|----------------|----------------|-----------|
| Designed By: | Drawn By: | Checked By: | Approved By: | Date: |
| Ar. Ashish Batra | Ar. Ashish Batra | k.Pushpanathan | R. Vishvnathan | June 2012 |

GUJARAT STATE HIGHWAYS PROJECT
(GSHP-II)

 **LEA Associates South Asia Pvt. Ltd.**
B-1/E-27, 11nd Floor, Mohan Cooperative Industrial Estate,
Mathura Road, New Delhi-110044
91-011-6973950-55

APPENDIX - 4: Environmental Monitoring Formats

Format EM1: Selection of disposal site locations

From _____ To _____

(Give chainage and nearest settlements from both ends)

| Criteria on which information for each site is to be collected | Site 1 | Site 2 | Site 3 | Site 4 |
|---|--------|--------|--------|--------|
| Area covered (m ²) | | | | |
| Total Material that can be dumped within the site (m ³) | | | | |
| Depth to which disposal is feasible (m) | | | | |
| Distance of nearest watercourse (m) | | | | |
| Nearest Settlement (m) | | | | |
| Date/s of Community Consultation/s | | | | |
| Whether the community is agreeable to siting of dumping site (Y/N) | | | | |
| Date of Permission from Village Council President(VCP) | | | | |
| Proposed future use of the Site | | | | |

Selected Site (tick any one column only)

Certified that the above information is correct to the best of my knowledge and belief.

Concessionaire's Site Engineer

Signed:

Date:

Name & Designation:

Recommendation on the suitability of the site

Decision Taken (tick one):

Approved/Not Approved

Environmental Engineer, IE

Signed:

Date:

Name and Designation of Deciding Authority

Enclosures

(Tick as appropriate)

- 1 Maps of each location
- 2 Photographs
- a Each disposal location
- b Each community consultation
- 3 Photocopies of permissions from VCPs

Format EM2: Construction Camp and Storage Area

Construction Stage: Report - Date _____ Month _____ Year _____

(Site Layout of Construction camp and working drawings of dwelling units with allied facilities to be attached with format)
Format to be submitted before target date (decided by PIU) of establishing camps

Location of Camp (km _____)

| Sl. No | Item | Unit | Details | Remarks |
|----------|---|--|---------|---------|
| 1 | Detail of item camp | | | |
| a | Size of Camp | mxm | | |
| b | Area of Camp | sq.m | | |
| c | Distance from Nearest Settlement | | | |
| d | Distance from Nearest Water Source | Type/Size/Capacity/Present Use/Ownership | | |
| e | Date of camp being operational dd/mm/yy | | | |
| f | Present land use | | | |
| g | No other trees with girth > 0.3m. | | | |
| h | Details of Storage area(Availability of impervious surface) | mxm | | |
| i | Availability of separate waste disposal from storage area | Cum | | |
| 2 | Details of top soil stacking | | | |
| a | Quantity of top soil removed | Cum | | |
| b | Detail of storage of topsoil | Describe stacking arrangement | | |
| 3 | Details of workforce | | | |
| a | Total No of Labourers | nos | | |
| b | Total no of Male Workers | nos | | |
| c | No of Male Workers below 18 years of age | nos | | |
| d | Total No of Female Workers | nos | | |
| e | No of Female workers below 18 years of age | nos | | |
| f | No of children | nos | | |
| 4 | Details of dwelling units | | | |
| a | No of dwellings/huts | nos | | |
| b | Minimum Size of Dwelling | mxm | | |
| c | No of openings per dwelling | nos | | |
| d | Minimum size of opening | mxm | | |
| e | Walls | specifications | | |
| f | Roofing | specifications | | |
| g | Flooring | specifications | | |
| h | Drinking Water Tank | specifications | | |
| i | Capacity of Drinking water Tank | cum | | |
| j | Size of Drinking Water Tank | mxmxm | | |
| k | Total no of WC | nos | | |
| l | No of Wcs for female workers | nos | | |
| m | Minimum Size of WC | mxm | | |
| n | Total No of Bathrooms for female workers | nos | | |
| o | Size of septic tank for WC/Baths | mxmxm | | |
| p | Capacity of Water Tank for WCs/ Bathrooms and general purpose | | | |
| q | Fencing around camp | Y/N | | |
| 5 | Details of facilities | | | |
| a | Availability of security guard 24 hrs a day | Yes/No | | |
| b | Details of First Aid Facility | Yes/No | | |
| c | Availability of Day Care Centre | Yes/No | | |
| d | Availability of dust bins (capacity 60 ltr) | nos | | |

Certified that the furnished information is correct the quality of work is as per god practice and all relevant information as required is attached

Concessionaire's Site Engineer

Environmental Engineer, IE

Format EM3: Reporting for Borrow Areas

Construction Stage Report: Date ____ Month____ Year____ Site Layout of Borrow Area and Proposed Borrow Area Redevelopment Plan to be attached with format Format to be submitted before target date as (decided by PIU) for establishing Borrow Areas Borrow Area No. BA_____
Location of Borrow Area (Km____)

| Sl. No | Item | Unit | Details | Remarks by CSC, if any |
|----------|---|---|---------|------------------------|
| 1 | Details of Borrow Area | | | |
| a | Date of Borrow Area becoming operational dd/mm/yy | | | |
| b | Current Landuse | | | |
| c | Distance from Nearest Settlement | Km | | |
| d | No of settlements within 200m of Haul Road | No. | | |
| e | No of settlements within 500m of Borrow Area | No. | | |
| f | Total Capacity | cum | | |
| g | No of Trees with girth more than 0.3 m | No. | | |
| h | Length of Haul Road | km | | |
| i | Width of Haul road | m | | |
| j | Type of Haul Road | metal/dirt | | |
| k | Size of Borrow Area | sqkm | | |
| l | Area of Borrow Area | km x km | | |
| m | Quantity Available | cum | | |
| n | Distance of Nearest Water Source | Type/Size/Capacity/Present Use/Ownership | | |
| o | Quantity of top soil removed | cum | | |
| p | Detail of storage of topsoil | | | |
| q | Daily/occasional use of the Borrow Area by the community, if any | - | | |
| r | Probable reuse of Borrow pit-ask community | - | | |
| s | Drainage channels/slope/characteristics of the area | - | | |
| 2 | Enhancement Elements | | | |
| a | Quantity of top soil removed | sq.m | | |
| b | Detail of storage of topsoil | sq.m | | |
| c | Adjoining land use/Natural elements | | | |
| d | Near by catchment for storing water | | | |
| e | Erosion Control Programme | | | |
| f | Preventive measures for | | | |
| i | Leaching | | | |
| ii | Mosquito Breeding | | | |
| iii | Water run-off/contamination | | | |
| iv | Any other environmental degradation | | | |
| 3 | Details of workforce | | | |
| a | Total No of Labourers | No. | | |
| b | Total no of Male Workers | No. | | |
| c | No of Male Workers below 18 years of age | No. | | |
| d | Total No of Female Workers | No. | | |
| e | No of Female workers below 18 years of age | No. | | |
| 4 | Details of redevelopment, Plan to be enclosed | | | |

Certified that the furnished information is correct the quality of work is as per good practice and all relevant information as required is attached

Concessionaire's Site Engineer

Environmental Engineer, IE

Format EM4: Tree Felling

| S.No | Links | Physical Target | | | | Completion Target | | |
|------|-------|-----------------|--------|-----------------|---------------------|-------------------|--------------------------------------|-------------------------|
| | | Total Target | Target | Target Achieved | % of task completed | Target Date | Date of Completion if task completed | Reason for Delay if any |
| | | Unit | | | | | | |
| 1 | | nos | | | | | | |
| 2 | | nos | | | | | | |
| 3 | | nos | | | | | | |
| 4 | | nos | | | | | | |

Concessionaire's Site Engineer

Environmental Engineer, IE

Format EM5: Tree Transplantation

Construction Stage: Quarterly Report -Date____ Month____ Year____

| Physical Target | | | | Financial Target | | |
|---|---------------|-----------------|-------------------|---------------------|---------------|--------------|
| Target (trees to be transplanted in Package) for this Quarter | | Target Achieved | | % of task completed | Total (lakhs) | Budget Spent |
| Km (From) / No. | Km (To) / No. | No. of Trees | Survival Rate (%) | | | |
| | | | | | | |
| | | | | | | |

Certified that the above information is correct

Concessionaire's Site Engineer

Environmental Engineer, IE

EM 6 Topsoil Conservation Monitoring

Contract _____

Report No. _____

Date _____

| Location (Chainage) | Original Use of Topsoil removed | Measures for preventing spillage of topsoil on Haul Roads(Earthen/Metalled) | Present Method of Storage | Anticipated period of Storage (Months) | Distance of nearest Water course (m) | Present Slope of Pile (V: H) | Whether silt fencing provided? | Is any other covering / measure provided? If yes, what is it? | Improvements required | Extent of Compliance as on date of report |
|------------------------|---------------------------------|---|---------------------------|--|--------------------------------------|------------------------------|--------------------------------|---|-----------------------|---|
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

Certified that the above is true.

Signed _____

Concessionaire's Site Engineer

Verified

Signed _____

Environmental Engineer, IE

EM 7 Redevelopment of Borrow Areas

Operation Stage: Report: Date ____ Month____ Year____

To be monitored by PIU during operation period

Details of remarks to be appended wherever necessary.

| Sl. No | Activity | Particulars | Drawbacks Identified | | | Improvements Required | | |
|--------|---|-------------|----------------------|-----------|------------------------|-----------------------|-----------|----------------------|
| | | | Construction | Financial | Others (Ask Community) | Technical | Financial | Remarks/ Suggestions |
| 1 | Details of Borrow area and Surrounding Landuse | | | | | | | |
| 2 | End use of the borrow area | | | | | | | |
| 3 | Whether rehabilitation has been carried out in line with owners request | | | | | | | |
| 4 | Erosion Control Measures | | | | | | | |
| 5 | Number of trees planted | | | | | | | |
| 6 | Reuse of topsoil | | | | | | | |
| 7 | Preventive measures taken for -Mosquito Breeding -Water runoff/ contamination -Other Environmental Degradation | | | | | | | |
| 8 | Any problems faced by owner | | | | | | | |
| 9 | Any problems faced by the local community | | | | | | | |
| 10 | If it has been developed as a fish pond, | | | | | | | |
| a | Details of available catchment for storing water | | | | | | | |
| b | Economic Benefits/Utility | | | | | | | |
| 11 | If it has been developed as an orchard | | | | | | | |
| a | Details of suitability of soil and water. | | | | | | | |
| B | Type of Plantation | | | | | | | |
| c | Economic Benefits/Utility | | | | | | | |
| 12 | Any Other End use | | | | | | | |
| a | Particulars | | | | | | | |
| b | Economic Benefits/Utility | | | | | | | |

Concessionaire's Site Engineer

Environmental Engineer, IE

EM 8 Checklist for Construction Safety

| Sl. No. | Safety Issues | Yes | No | Non compliance | Corrective Action | Penalty | Remarks |
|---|---|-----|----|----------------|-------------------|---------|---------|
| Safety during Construction Stage | | | | | | | |
| 1 | Appointment of qualified Construction safety officers | | | | | | |
| 2 | Approval for Construction Safety Management Plan by the Engineer. | | | | | | |
| 3 | Approval for Traffic Management/control Plan in accordance with IRC: SP: 55-2001 | | | | | | |
| 4 | Maintenance of the existing road stretches handed over to the Contractor. | | | | | | |
| 5 | Provision of Temporary Traffic Barriers/Barricades/caution tapes in construction zones | | | | | | |
| 6 | Provision of traffic sign boards | | | | | | |
| 7 | Provision for flags and warning lights | | | | | | |
| 8 | Provision of metal drum/empty bitumen drum delineator, painted in circumferential strips of alternate black and white 100mm wide 2 coats fitted with reflectors 3 Nos of 7.5cm diameter | | | | | | |
| 9 | Providing plastic crash barrier | | | | | | |
| 10 | Provision of adequate staging, form work and access (ladders with handrail) for works at a height of more than 3.0 m | | | | | | |
| 11 | Provision of adequate shoring / bracing / barricading / lighting for all deep excavations of more than 3.0 m depth. | | | | | | |
| 12 | Demarcations (fencing, guarding and watching) at construction sites | | | | | | |
| 13 | Provision for sufficient lighting especially for night time work | | | | | | |
| 14 | Arrangements for controlled access and entry to Construction zones | | | | | | |
| 15 | Safety arrangements for Road users / Pedestrians | | | | | | |
| 16 | Arrangements for detouring traffic to alternate facilities | | | | | | |
| 17 | Regular Inspection of Work Zone Traffic Control Devices by authorized contractor personnel | | | | | | |
| 18 | Construction Workers safety - Provision of personnel protective equipments | | | | | | |
| 19 | A. Helmets | | | | | | |
| | B. Safety Shoe | | | | | | |
| | C. Dust masks | | | | | | |
| | D. Hand Gloves | | | | | | |
| | E. Safety Belts | | | | | | |
| | F. Reflective Jackets | | | | | | |
| | G. Earplugs for labour | | | | | | |
| 20 | Workers employed on bituminous works, stone crushers, concrete batching plants etc. provided with protective goggles, gloves, gumboots etc. | | | | | | |
| 21 | Workers engaged in welding work shall be provided with welder protective shields | | | | | | |

| Sl. No. | Safety Issues | Yes | No | Non compliance | Corrective Action | Penalty | Remarks |
|---------|---|-----|----|----------------|-------------------|---------|---------|
| 22 | All vehicles are provided with reverse horns. | | | | | | |
| 23 | All scaffolds, ladders and other safety devices shall be maintained in as safe and sound condition | | | | | | |
| 24 | Regular health check-up for labour/ Contractor's personnel | | | | | | |
| 25 | Ensuring the sanitary conditions and all waste disposal procedures & methods in the camps. | | | | | | |
| 26 | The Contractor shall provide adequate circuit for traffic flow around construction areas, control speed of construction vehicles through road safety and training of drivers, provide adequate signage, barriers and flag persons for traffic control | | | | | | |
| 27 | Provision for insurance coverage to the contractor's personnel | | | | | | |

Concessionaire's Site Engineer

Environmental Engineer, IE

Format EC1: Target Sheet for Pollution Monitoring

Construction Stage: Report - Date _____ Month _____ Year _____

(Locations at which monitoring to be conducted as per EMP)

| Sl. No | Chainage | Details of Location | Duration of Monitoring | Instruments Used | Completion Target | | Reason for Delay if any |
|-------------------------|----------|---------------------|------------------------|------------------|-------------------|--------------------------------------|-------------------------|
| | | | | | Target Date | Date of Completion if task completed | |
| Air Monitoring | | | | | | | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| Water Monitoring | | | | | | | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| Noise Monitoring | | | | | | | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |

Certified that the Pollution Monitoring has been conducted at all the locations specified in the EMP

Concessionaire's Site Engineer

Environmental Engineer, IE

Format EC 2: Target Sheet for Pollution Monitoring

Operation Stage: Report - Date _____ Month _____ Year _____

(Locations at which monitoring to be conducted)

| Sl. No | Chainage | Details of Location | Duration of Monitoring | Instruments Used | Completion Target | | Reason for Delay if any |
|-------------------------|----------|---------------------|------------------------|------------------|-------------------|--------------------------------------|-------------------------|
| | | | | | Target Date | Date of Completion if task completed | |
| Air Monitoring | | | | | | | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| Water Monitoring | | | | | | | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| Noise Monitoring | | | | | | | |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |

Certified that the Pollution Monitoring has been conducted at all the locations specified in the EMP

Concessionaire's Site Engineer

Environmental Engineer, IE

Format OP 1: Survival Rate of Trees

Operation Stage: Report - Date_____ Month_____ Year_____

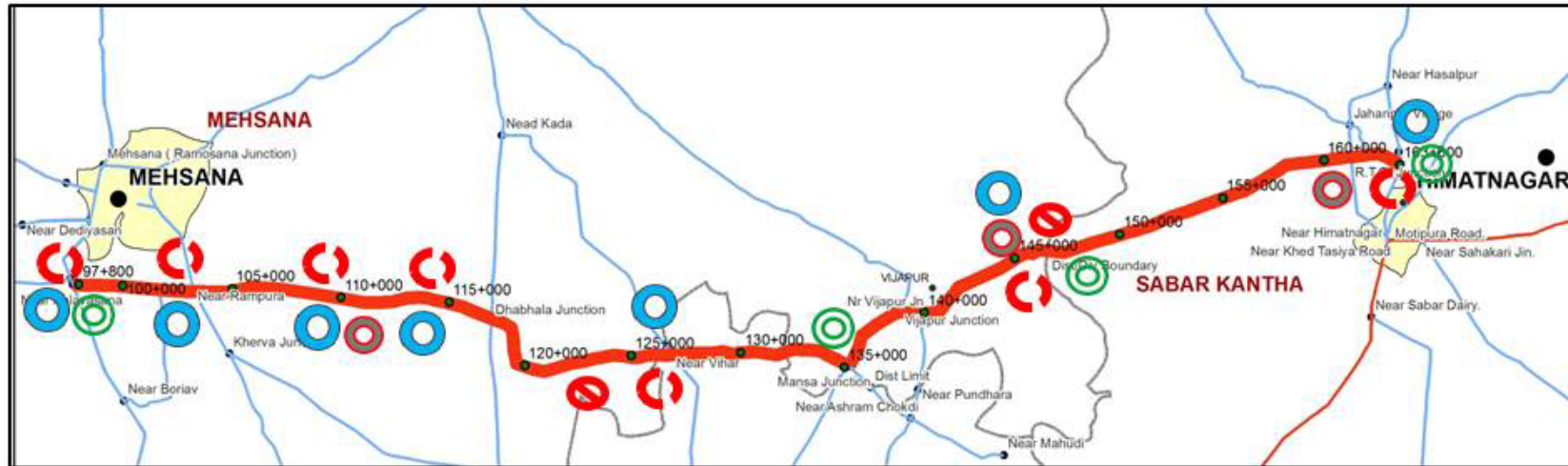
| S. No. | Landscape Section | Roadside Trees | | | Landscaping at Junctions | | | Turfing on Embankment | | |
|--------|-------------------|---------------------|-----------------|------------|--------------------------|-----------------|------------|-----------------------|-----------------------------|------------|
| | Km-Km | Total Trees Planted | Total Surviving | % Survival | Total Shrubs Planted | Total Surviving | % Survival | Total Area Turfed | Total Turfed Area Surviving | % Survival |
| | | Nos. | Nos. | % | Nos. | Nos. | % | Sqm. | Sqm. | % |
| | | | | | | | | | | |
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Certified that the above information is correct






Concessionaire's Site Engineer

Environmental Engineer, IE

APPENDIX -5: Environmental Monitoring Locations: Mehsana-Himatnagar (SH-55) Corridor



Legend

-  Air quality
-  Surface Water quality
-  Noise quality
-  Ground Water quality
-  Soil quality

| Monitoring Locations | | |
|----------------------|--|-----------------------|
| Env. Parameters | Corridor Sections (SH: 055) | |
| | CH: 97+800 – 147+000 | CH: 147+000 – 163+600 |
| Air Quality | 97+800, 102+200, 109+000, 114+000, 126+000, 145+000 | 163+600 |
| Noise Quality | 97+800, 102+200, 114+000, 126+200, 145+000 | 163+600 |
| Water Quality | 97+800, 123+200, 135+000, 146+800 | 147+400, 163+600 |
| Soil Quality | 110+000, 145+000 | 160+000 |

APPENDIX – 6: Guidelines for Environmental Management

GUIDELINE-1: SITE PREPARATION

1. GENERAL

The preparation of site for construction involves: (i) clearing of land required for construction; and (ii) management of activities such as traffic during construction. These activities have been detailed out for road construction activities separately.

2. ROAD CONSTRUCTION

2.2 Site Preparation Activities

After obtaining the consent of the community on the alignment, the Project Implementation Unit (PIU) of the Divisional Office shall be responsible to stake out the alignment by establishing working benchmarks on ground. It shall be the responsibility of the PIU to take over the possession of the proposed RoW and hand over the land width required clear of all encumbrances to the Concessionaire. Activities pertaining to the clearance of land and relocation of utilities need to be initiated by the PIU well in advance to avoid any delays in handing over of site to the Concessionaire. Assistance of the Revenue Department shall be sought in accomplishing the task. To summarize, the PIU's responsibilities before handing over the site to the Concessionaire include:

- Clearance of encroachments within proposed RoW;
- Initiation of process for legal transfer of land title;
- Alignment modification or Relocation of common property resources in consultation with the local community;
- Alignment modification or Relocation of utilities in consultation with the various government departments; and
- Obtain clearances required from government agencies for
 - Cutting of trees; and
 - Land Diversion of forestlands, etc.

2.2 Site Preparation Activities by the Concessionaire

Site preparation shall involve formation of the road base wherein it is ready for construction of protective/drainage works, carriageway, shoulders, parapets and other road furniture. The PIU shall transfer the land for civil works to the Concessionaire after peg marking of the alignment.

The Concessionaire shall verify the benchmarks soon after taking possession of the site. The Concessionaire, prior to initiation of site preparation activities, shall highlight any deviations/discrepancies in these benchmarks to the Independent Engineer in writing. The Concessionaire shall submit the schedules and methods of operations for various items during the construction operations to the Independent Engineer for approval. The Concessionaire shall commence operations at site only after the approval of the schedules by the Independent Engineer.

The activities to be undertaken by the Concessionaire during the clearing and grubbing of the site are as follows:

The clearance of site shall involve the removal of all materials such as trees, bushes, shrubs, stumps, roots, grass, weeds, part of topsoil and rubbish. Towards this end, the Concessionaire shall adopt the following measures: (i) Limiting the surface area of erodible earth material exposed by clearing and grubbing; (ii) Conservation of top soil and stock piling as per the measures suggested as part of **Guideline 4**, "Top Soil Salvage Storage and Replacement"; and (iii) Carry out necessary backfilling of pits resulting from uprooting of trees and stumps with excavated or approved materials to the required compaction conforming to the surrounding area.

To minimize the adverse impact on vegetation, only ground cover/shrubs that impinge directly on the permanent works shall be removed. Cutting of trees and vegetation outside the working area shall be avoided under all circumstances. In case the alignment passes through forest areas, The Forest Ranger shall be consulted for identification of presence of any rare/endangered species within the proposed road way. Protection of such species if found shall be as per the directions of the Forest Department.

The locations for disposal of grubbing waste shall be finalized prior to the start of the works on any particular section of the road. The selection of the site shall be approved by the Independent Engineer. The criteria for disposal of wastes shall be in accordance with the measures given in Guideline on, “Waste Management and Debris Disposal” (**Guideline 8**).

In locations where erosion or sedimentation is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion and sedimentation control features can follow immediately, if the project conditions permit.

Dismantling of CD structures and culverts shall be carried out in a manner as not to damage the remaining required portion of structures and other surrounding properties. The disposal of wastes shall be in accordance with the provisions given in **Guideline 8**, “Waste Management and Debris Disposal”. The following precautions shall be adopted: (i) The waste generated shall not be disposed off in watercourses, to avoid hindrance to the flow, and (ii) All necessary measures shall be taken while working close to cross drainage channels to prevent earthwork, stonework as well as the method of operation from impeding cross drainage at rivers, streams, water canals and existing irrigation and drainage systems.

The designated sites duly approved by Implementing Agency shall be cleared of its existing cover for setting up of the construction sites, camps and related infrastructure facilities, borrow areas and other locations identified for temporary use during construction. The Concessionaire shall comply with all safety requirements in consideration as specified in the **Guideline 12** on, “Labour & Worker’s Health and Safety”. Before initiation of site preparation activities along these lands to be used temporarily during construction, it shall be the responsibility of the Concessionaire to submit and obtain approval of the site redevelopment plan from the implementing agency. The letter/contract agreement between the owner(s) of the land parcel for temporary usage shall include site redevelopment to its original status. The guidelines for the same are furnished in the Guideline on, “Construction Plants & Equipment Management”; guideline, “Construction and Labour Camps”; and “Borrow areas”.

2.2 Traffic management during construction

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

- Partial pavement construction **over long lengths will not be permitted**. The Concessionaire should concentrate his activities over sections such that he can complete continuous fronts of up to a maximum of 1 km before starting the adjacent front. The Concessionaire may open more than one continuous 1 km front provided that he has the separate resources to do so. The resources working on a 1 km front may not be shifted to another front until no longer required on that front.
- The construction activities should be staggered over sub-sections to the extent that the use of plant and equipment is optimized to maximum efficiency and to avoid idling. For road widening operations, excavation **adjacent to the existing road shall not be permitted on both titles simultaneously**. Earthworks must be completed to the level of the existing road before excavation work on the opposite side will be permitted.
- The construction operations taking place on a particular front must be managed efficiently such that delays between successive pavement layers are minimized.
- Before the start of the monsoon season (June) the Concessionaire shall ensure that the pavement over any front is complete, full width, at least upto Dense Bituminous Macadam, DBM level, but preferably with Asphaltic Concrete, AC wearing course. The Concessionaire **should not start any sections of pavement that he cannot complete by the start of the monsoon season**.
- In the absence of permanent facilities, temporary drainage and erosion control measures, as required by the Specifications, are to be implemented prior to the onset of the monsoon.

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

On a 1km section, the pavement construction (except new alignments) should be limited to 500m sub-sections with a minimum of 1 to 1.5 km between successive sub-sections to ease traffic management and safety issues. The earthworks in the widening portions are not limited in, this respect. Excavation on both sides of the existing, road over the same sub-section simultaneously shall not be permitted for reasons of safety to the traffic, particularly at night.

Sub-sections longer than 500 m may be authorized by the Independent Engineer if two-way traffic flow can be comfortably managed and the Concessionaire **can demonstrate his ability to maintain dust control, proper road edge delineation, proper signage and traffic control.** Where single file traffic is permitted (only applicable to final wearing course operations), the sub-sections shall be reduced to a maximum length whereby safe traffic regulation can be physically managed. Single file traffic may not be permitted at certain locations or times of the day when traffic volumes are such that excessive congestion shall occur.

GUIDELINE-2: CONSTRUCTION AND LABOUR CAMPS

1. INTRODUCTION

The scope of this guideline pertains to the siting, development, management and restoration of construction and labour camps to avoid or mitigate impacts on the environment. The area requirement for the construction camp shall depend upon the size of contract, number of labourers employed and the extent of machinery deployed. The following sections describe the siting, construction, maintenance, provision of facilities in the camps and finally rehabilitation of the construction and labour camps. These are described in three stages, pre-construction, construction and post-construction stage. The issues related to construction camps are similar in the case of road construction and hence have been taken together.

2. PRE-CONSTRUCTION STAGE

Identification of site for construction and labour camps is the first task. The Concessionaire shall identify the site for construction camp in consultation with the individual owners in case of private lands and the concerned department in case of Government lands. The suitable sites shall be selected and finalized in consultation with the Independent Engineer. **Table 1** gives the lands that could be avoided for construction camps and conversely those that could be preferred.

Table 2-1: Selection Criterion for Construction Camps.

| Avoid the following ... | Prefer the following ... |
|--|--|
| <ul style="list-style-type: none"> • Lands close to habitations. • Irrigated agricultural lands. • Lands belonging to small farmers. • Lands under village forests. Lands within 100m of community water bodies and water sources as rivers. • Lands within 100m of watercourses. • Low lying lands. • Lands supporting dense vegetation. • Grazing lands and lands with tenure rights. • Lands where there is no willingness of the landowner to permit its use. | <ul style="list-style-type: none"> • Waste lands. • Waste Lands belonging to owners who look upon the temporary use as a source of income. • Community lands or government land not used for beneficial purposes. • Private non-irrigated lands where the owner is willing. • Lands with an existing access road. |

The Concessionaire will work out arrangements for setting up his facilities during the duration of construction with the land owner/concerned department. These arrangements shall be in the form of written agreement between the Concessionaire and the land owner (private/government) that would specify:

- a) photograph of the proposed camp site in original condition;
- b) activities to be carried out in the site;
- c) environmental mitigation measures to be undertaken to prevent land, air, water and noise pollution;
- d) detailed layout plan for development of the construction and labour camp that shall indicate the various structures to be constructed in the camp including temporary, drainage and other facilities (**Figure 1** gives a layout plan for a construction camp); and
- e) Restoration plan of camp site to previous camp conditions.

The arrangements will be verified by the Independent Engineer to enable redressal of grievances at a later stage of the project.

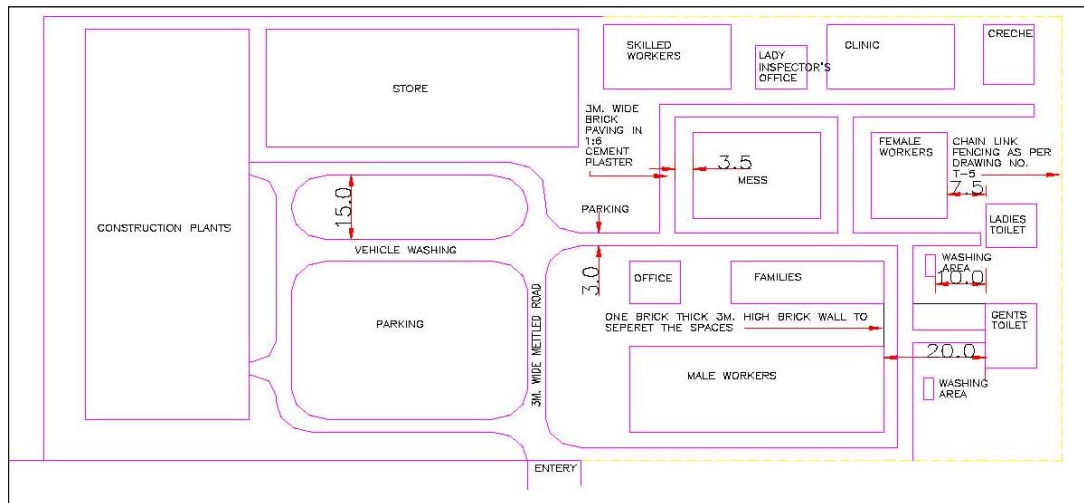


Figure 2-1: Layout Plan for Construction Camp

2.2 Setting up of labour camp

The Concessionaire shall provide, free of cost in the camp site, temporary living accommodation to all the migrant workers employed by him for complete construction/maintenance work is in progress. A minimum area of 6 sq.mts per person shall be provided. The rooms of labour shall be well lighted and ventilated. The facilities to be provided for the labour are discussed below:

a) Drinking Water

Towards the provision and storage of drinking water at the construction camp, the Concessionaire shall ensure the following provisions

- The Concessionaire shall provide for a continuous and sufficient supply of potable water in the camps, in earthen pots or any other suitable containers.
- The Concessionaire shall identify suitable community water sources for drinking. Only in the event of non-availability of other sources of potable water, the Concessionaire shall obtain water from an unprotected source only after the testing for its potable. Where water has to be drawn from an existing open well, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be entirely closed in and be provided with dust proof trap door.
- Every water supply or storage shall be at a distance of not less than 15m from any wastewater / sewage drain or other source of pollution. Water sources within 15m proximity of toilet, drain or any source of pollution will not be used as a source of drinking water in the project.
- A pump shall be fitted to covered well used as drinking water source, the trap door shall be kept locked and opened only for cleaning or inspection, which shall be done at least once a month.

b) Washing and Bathing Facilities

In every site, adequate and suitable facilities for washing clothes and utensils shall be provided and maintained for the use of contract labor employed therein. Separate and adequate bathing shall be provided for the use of male and female workers. Such facilities shall be conveniently accessible and shall be kept in clean and hygienic conditions.

c) Toilets Facilities

Sanitary arrangements, latrines and urinals shall be provided in every work place separately for male and female workers. The arrangements shall include:

- A latrine for every 15 females or part thereof (where female workers are employed).
- A latrine for every 10 males.
- Every latrine shall be under cover and so partitioned as to secure privacy, and shall have a proper door and fastenings.
- Where workers of both sexes are employed, there shall be displayed outside each block of latrine and

urinal, a notice in the language understood by the majority of the workers “For Men Only” or “For Women Only” as the case may be.

- The latrines and urinals shall be adequately lighted and shall be maintained in a clean sanitary condition at all times and should have a proper drainage system;
- Water shall be provided in or near the latrines and urinals by storage in suitable containers.

d) Waste Disposal

- Disposal of sanitary wastes and excreta shall be into septic tanks.
- Kitchen waste water shall be disposed into soak pits/kitchen sump located preferably at least 15 meters from any water body. Sump capacity should be at least 1.3 times the maximum volume of wastewater discharged per day. The bottom of the pit should be filled with coarse gravel and the sides shored up with board, etc. to prevent erosion and collapse of the pit. New soak pits shall be made ready as soon as the earlier one is filled.
- Solid wastes generated in the kitchen shall be reused if recyclable or disposed off in land fill sites.

e) Medical and First Aid Facilities

Medical facilities shall be provided to the labour at the construction camp. Visits of doctor shall be arranged twice a month wherein routine checkups would be conducted for women and children. A separate room for medical checkups and keeping of first aid facilities should be built. The site medical room should display awareness posters on safety facilitation hygiene and HIV/AIDS awareness.

- First Aid Box will be provided at every construction campsite and under the charge of a responsible person who shall always be readily available during working hours. He shall be adequately trained in administering first aid-treatment. Formal arrangement shall be prescribed to carry injured person or person suddenly taken ill to the nearest hospital. The first aid box shall contain the following.
 - 6 small sterilized dressings
 - 3 medium size sterilized dressings
 - 3 large size sterilized dressings
 - 3 large sterilized burns dressings
 - 1 (30 ml) bottle containing 2 % alcoholic solution of iodine
 - 1 (30 ml) bottle containing salvolatile
 - 1 snakebite lancet
 - 1 (30 gms) bottle of potassium permanganate crystals
 - 1 pair scissors
 - Ointment for burns
 - A bottle of suitable surgical antiseptic solution

In case, the number of labour exceeds 50, the items in the first aid box shall be doubled.

f) Provision of Shelter during Rest

The work place shall provide four suitable sheds, two for meals and two for rest (separately for men and women). The height of the shelter shall not be less than 3.0m from the floor level to the lowest part of the roof. These shall be kept clean.

g) Crèches

In case 20 or more women workers are employed, there shall be a room of reasonable size for use of children under the age of six years. The room should have adequate light and realisation. A caretaker is to be appointed to look after the children. The use of the room shall be restricted to children, their mothers and the caretaker.

2.2 Storage of Construction Material in Construction Camps

For storage of Petrol/Oil/Lubricants, brick on edge flooring or sand flooring will be provided at the storage places of Petrol/Oil/Lubricants to avoid soil and water contamination due to spillage. These should be kept away from labour residential areas. The storage of cement shall be at Damp-proof flooring, as per IS codes. All materials shall be stored in a barricaded area. In case of electrical equipments, danger signs shall be posted. The batch mix plant is to be located away from the residential area and not in the wind direction.

Separate parking areas for vehicles and also workshop areas need to be provided.

2.2 Fire fighting arrangement

- The following precautions need to be taken:
- Demarcation of area susceptible to fires with cautionary signage;
- Portable fire extinguishers and/or sand baskets shall be provided at easily accessible locations in the event of fire;
- Concessionaire shall educate the workers on usage of these equipments.

2.2 Interactions with host communities

To ensure that there is no conflict of the migrant labor with the host communities, the Concessionaire shall issue identity cards to labourers and residents of construction camps.

3. CONSTRUCTION STAGE

Construction camps shall be maintained free from litter and in hygienic condition. It should be kept free from spillage of oil, grease or bitumen. Any spillage should be cleaned immediately to avoid pollution of soil, water stored or adjacent water bodies. The following precautions need to be taken in construction camps.

- Measures to ensure that no leaching of oil and grease into water bodies or underground water takes place.
- Wastewater should not be disposed into water bodies.
- Regular collection of solid wastes should be undertaken and should be disposed off safely.
- All consumables as the first aid equipment, cleaning equipment for maintaining hygiene and sanitation should be recouped immediately.
- The debris/scraps generated during construction should be kept in a designated and barricaded area.

The Independent Engineer will monitor the cleanliness of construction campsites and ensure that the sites are properly maintained throughout the period of the contract.

4. POST CONSTRUCTION STAGE

At the completion of construction, all construction camp facilities shall be dismantled and removed from the site. The site shall be restored to a condition in no way inferior to the condition prior to commencement of the works. Various activities to be carried out for site rehabilitation include:

- Oil and fuel contaminated soil shall be removed and transported and buried in waste disposal areas.
- Soak pits, septic tanks shall be covered and effectively sealed off.
- Debris (rejected material) should be disposed off suitably (Refer **Guideline - 10** on “Waste Management and Debris Disposal”).
- Ramps created should be levelled.
- Underground water tank in a barren/non-agricultural land can be covered. However, in an agricultural land, the tank shall be removed.
- If the construction camp site is on an agricultural land, top soil can be spread so as to aid faster rejuvenation.
- Proper documentation of rehabilitation site is necessary. This shall include the following: –Photograph of rehabilitated site;
 - Land owner consent letter for satisfaction in measures taken for rehabilitation of site;
 - Undertaking from Concessionaire; and
 - Certification from Independent Engineer.

In cases, where the construction camps site is located on a private land holding, the Concessionaire would still have to restore the campsite as per this guideline. Also, he would have to obtain a certificate for satisfaction from the landowner.

GUIDELINE-3: BORROW AREAS

1. INTRODUCTION

Embankment fill material is to be procured from borrow areas designated for the purpose. Borrow areas cause significant adverse environmental impacts if appropriate mitigation measures are not taken. The scope of this guideline includes measures that are required during project planning and design stage, pre-construction, construction stage and post construction stage. Borrow areas are related only to road construction activities.

2. PROJECT PLANNING AND DESIGN STAGE

Design measures for reduction in the quantity of the earthwork will have to be undertaken to reduce the quantity of material extracted and consequently decrease the borrow area requirement. Borrow area siting should be in compliance with IRC: 10-1961. The DPR shall contain (i) Guidelines for locating site of borrow areas and borrow material specifications.

3. PRE-CONSTRUCTION STAGE

The Concessionaire shall identify the borrow area locations in consultation with the individual owners in case of private lands and the concerned department in case of government lands, after assessing suitability of material. The suitable sites shall be selected and finalized in consultation with the Independent Engineer. Borrowing to be avoided on the following areas:

- Lands close to toe line.
- Irrigated agricultural lands (In case of necessity for borrowing from such lands, the topsoil shall be preserved in stockpiles. The subsequent Guidelines discuss in detail the conservation of topsoil.
- Grazing land.
- Lands within 0.8km of settlements.
- Environmentally sensitive areas such as Reserve Forests, Protected Forests, Sanctuary, wetlands. Also, a distance of 1000 m should be maintained from such areas.
- Designated protected areas / forests.
- Unstable side-hills.
- Water-bodies.
- Streams and seepage areas.
- Areas supporting rare plant/ animal species;
- Ensure unsuitable soft rock is not prominent within the proposed depth of excavation which will render rehabilitation difficult.

3.1 Arrangements for Borrow Area

The Concessionaire will work out arrangements for borrowing with the land owner/concerned department. The arrangements will include the redevelopment after completion of borrowing. The arrangements will be verified by the Independent Engineer to enable redressal of grievances at a later stage of the project. The Independent Engineer shall approve the borrow area after inspection of the site to verify the reclamation plan and its suitability with the Concessionaire and landowner. The Concessionaire shall commence borrowing soil only after the approval by the Independent Engineer. The Concessionaire shall submit to the Independent Engineer the following before beginning work on the borrow areas.

- Written No-objection certificate of the owner/cultivator;
- Estimate extent of earth requires;
- Extent of land required and duration of the agreement;
- Photograph of the site in original condition; and
- Site redevelopment plan after completion.

The depth of excavation should be decided based on natural ground level of the land and the surroundings, and rehabilitation plan. In case higher depth of excavation is agreed with backfilling by unsuitable excavated soil (from roadway), then filling should be adequately compacted except topsoil, which is to be

spread on the top most layer (for at least 20m thick). The guidelines for location, depth, size and shape of the borrow areas are available in the following:

- Clause 305.2.2.2 of MoRTH specification for roads and bridge works of IRC;
- Guidelines for environmental impact assessment of highway projects, Indian Roads Congress, 1989: (IRC: 104-1988);
- IRC: 10-1961-Recommended practice for borrow pits for road embankments constructed by manual operations, as revised in 1989;
- IRC SP: 58-2001 guideline for use of fly ash in road construction;
- EIA manual of MoEF, 2001;
- MoEF notification on utilisation of fly ash dated 27 August, 2005.

3.2 Documentation of Borrow Pit

The Concessionaire must ensure that following data base must be documented for each identified borrow areas that provide the basis of the redevelopment plan.

- Chainage along with offset distance;
- Area (Sq.m);
- Photograph of the pit from all sides;
- Type of access/width/kutcha/puccaetc from the carriageway;
- Soil type;
- Slope/drainage characteristics;
- Water table of the area or identify from the nearest well, etc;
- Existing landuse, for example barren/agricultural/grazing land;
- Location/name/population of the nearest settlement from borrow area;
- Present usage of borrow area; and
- Community facility in the vicinity of borrow pit.

3.3 Redevelopment Plans for Borrow Pits

The following checklist provides guidelines in order to ensure that redevelopment of borrow areas must comply with MoRTH, clause 305.2.2.2 and EMP requirement. Borrow areas can be developed as:

- Ponds (various types) (eg: Drinking Water only; Washing and for other Domestic Chores; Only for Cattle; Mixed Uses etc.) (a large pond can be divided into two parts - each having a defined use)
- Farmland submission
- Water Recharging Zones
- Pastureland
- Fish Ponds (pisciculture)
- Waste disposal Sites (depending upon the location, distance from settlements, pollution risks, safety, associated environmental risks and hazards, regulations/ permissions of appropriate authority and other such factors)
- Plantation Zones
- Recreational Zones (depending upon location, size, potential of the site, willingness of the local bodies to develop it)
- Wildlife Refuge and Drinking Area (applicable only in case of sensitive environs with appropriate planning and understanding including regulation of depth for safety of animals etc.)

The rehabilitation measures for the borrow areas shall be dependent on the following factors:

- Land use objectives and agreed post-borrowing activities;
- Physical aspects (landform stability, erosion, re-establishment of drainage);
- Biological aspects (species richness, plant density,) for areas of native re vegetation;
- Water quality and soil standards; and
- Public safety issues.

Rehabilitation should be simple and maintenance free. Depending on the choice of the individual land owner/community, the Concessionaire shall prepare redevelopment plans for the borrow areas. The options can be: (i) Restoring the productive use of the land (ii) Development of detention ponds in barren areas.

Option I: Suitable in locations with high rainfall and productive areas

Topsoil must be placed, seeded, and mulched within 30 days of final grading if it is within a current growing season or within 30 days of the start of the next growing season. Vegetative material used in reclamation must consist of grasses, legumes, herbaceous, or woody plants or a combination thereof, useful to the community for the fuel and fodder needs.

Plants must be planted during the first growing season following the reclamation phase.

Selection and use of vegetative cover must take into account soil and site characteristics such as drainage, pH, nutrient availability, and climate to ensure permanent growth. The vegetative cover is acceptable if within one growing season of seeding, the planting of trees and shrubs results in a permanent stand, or regeneration and succession rate, sufficient to assure a 75% survival rate.

Option II: In barren land, the borrow areas can be redeveloped into detention ponds.

These will be doubled up as water bodies and also for removal of sediment from runoff flowing through the ponds. Design of the detention basin depends upon the particle size, settling characteristics, residence time and land area. A minimum of 0.02 mm size particle with a settling velocity of 0.02 cm/sec (assuming specific gravity of solids 2.65) can be settled in the detention basin.

Following parameters are to be observed while setting up a detention pond:

- Pond should be located at the lowest point in the catchment area. Care should be taken that the horizontal velocity should be less than settling velocity to prevent suspension or erosion of deposited materials.
- Minimum Effective Flow Path: 5 times the effective width
- Minimum Free Board: 0.15 m
- Minimum Free Settling Depth: 0.5 m
- Minimum Sediments Storage Depth: 0.5 m
- Maximum interior slope: 2H : 1V
- Maximum exterior slope: 3H : 1V
- The inlet structure should be such that incoming flow should distribute across the width of the pond. A pre-treatment sump with a screen should provide to remove coarse sediments. Settled sediment should be removed after each storm event or when the sediment capacity has exceeded 33% of design sediment storage volume. Accumulated sediment must be disposed of in a manner, which will prevent its re-entry into the site drainage system, or into any watercourse.

4. CONSTRUCTION STAGE

No borrow area shall be operated without permission of the Independent Engineer. The procurement of borrow material should be in conformity to the guidelines laid down in IRC: 10-1961. In addition, the Concessionaire should adopt precautionary measures to minimise any adverse impacts on the environment. Checklists for monitoring borrow areas operation and management has been prepared (**Table 3-1**).

Table 3-1: Checklist for Monitoring Borrow Area Operation and Management

| Attributes | Requirements |
|-----------------------|--|
| Access Road | Access road shall be used for hauling only after approved |
| Top soil preservation | To soil, if any, shall be stripped and stored at corners of the area before the start of excavation for material collection; Top soil should be reused / re-laid as per agreed plan; In case of riverside, borrow pit should be located not less than 15m from the toe of the bank, distance depending on the magnitude and duration of flood to be withstood. In no case shall be borrow pit be within 1.5m from the Toe line of the proposed embankment. |
| Depth of excavation | For agricultural land, the total depth of excavation should be limited to 150cm including top 30 cm for top soil preservation; For river side borrow area, the depth of excavation shall be regulated so that the inner edge of any borrow pit, should not be less than 15m from the toe of the bank and bottom of the pit should not cut the imaginary line of 1:4 projected from the edge of the final section of the embankment. To avoid |

| Attributes | Requirements |
|--|--|
| | any embankment slippage, the borrow areas will not be dug continuously, and the size and shape of borrow pits will be decided by the Independent Engineer. |
| Damage to surrounding land | Movement of man and machinery should be regulated to avoid damage to surrounding land. To prevent damages to adjacent properties, the Concessionaire shall ensure that an undisturbed buffer zone exists between the distributed borrow areas and adjacent land. Buffer zone shall be 3 m wide or equal to the depth of excavation whichever is greater. |
| Drainage control | The Concessionaire shall maintain erosion and drainage control in the vicinity of all borrow pits and make sure that surface drains do not affect the adjacent land or future reclamation. This needs to be rechecked by the Independent Engineer. |
| Dust Suppression | Water should be sprayed on kutchha haul road twice a day or as may be required to avoid dust generation during transportation of material; Depending on moisture content, 0.5 to 1.5% water may be added to excavated soil before loading during dry weather to avoid fugitive dust emission. |
| Covering material for transport material | Material transport shall be provided with tarpaulin cover |
| Personal Protective Equipment | Workers should be provided with helmet, gumboots and air mask and their use should be strictly enforced. |
| Redevelopment | The area should be redeveloped within agreed timeframe on completion of material collection as per agreed rehabilitation plan. |

5. POST CONSTRUCTION STAGE

All reclamation shall begin within one month of abandonment of borrow area, in accordance with the redevelopment plan. The site shall be inspected by the Independent Engineer after implementation of the reclamation plan. Certificate of Completion of Reclamation is to be obtained by the Concessionaire from the landowner that “the land is restored to his satisfaction”. The final payment shall be made after the verification by Independent Engineer.

6. CHECKLIST FOR INSPECTION OF REHABILITATION AREA

Inspection needs to be carried out by the Independent Engineer for overseeing the redevelopment of borrow areas as per the plan. The checklist for the inspection by the Independent Engineer is given below.

- Compliance of post-borrowing activities and land use with the restoration plan;
- Drainage measures taken for inflow and outflow in case borrow pit is developed as a detention pond;
- Levelling of the bottom of the borrow areas;
- In case the borrow area is on private property, the Concessionaire shall procure written letter from landowner for satisfaction on rehabilitation. In case of no rehabilitation is desired by the landowner, the letter should include statement “no responsibility of R&BD on Concessionaire in the event of accident.
- Condition of the reclaimed area in comparison with the pre-borrowing conditions.

GUIDELINE-4: TOPSOIL SALVAGE, STORAGE AND REPLACEMENT

1. INTRODUCTION

Loss of topsoil is a long term impact along roads due to (i) site clearance and widening for road formation (ii) development of borrow areas (iii) temporary construction activities such as construction camps, material storage locations, diversion routes etc. The environmental measures for both these activities during all stages of construction activity are discussed in the subsequent sections.

2. PROJECT PLANNING & DESIGN STAGE

At the project preparation stage, the following shall be estimated: (i) Extent of loss of top soil due to widening and siting of construction activities (ii) Estimates of borrow area requirements and (iii) Area requirement for topsoil conservation. The bid document shall include provisions that necessitate the removal and conservation of topsoil at all locations opened up for construction by the Concessionaire.

3. PRE-CONSTRUCTION STAGE

The arrangements for temporary usage of land, borrowing of earth and materials by the Concessionaire with the land owner/concerned department shall include the conservation / preservation of topsoil.

4. CONSTRUCTION STAGE

It shall be the responsibility of the Concessionaire to strip the topsoil at all locations opened up for construction. The stripped topsoil should be carefully stockpiled at suitable accessible locations approved by the Independent Engineer. At least 10% of the temporarily acquired area shall be earmarked for storing topsoil. In case of hilly and desert areas, topsoil with humus wherever encountered while opening up the site for construction shall be stripped and stockpiled. The stockpiles shall be located at:

- Areas away from Grade, Subsoil & Overburden materials;
- Areas away from pit activities and day-to-day operations;
- Areas that do not interfere with future pit expansion; and
- Areas away from drainage paths and uphill of sediment barriers.

The stockpiles for storing the topsoil shall be designed such that the slope should not be less than 1:2 (Vertical to horizontal), and the height of the pile is restricted to 2m. A minimum distance of 1m is required between stockpiles of different materials.

In cases where the topsoil has to be preserved for more than a month, the stockpile is to be stabilised within 7 days of forming. The stabilisation shall be carried out through temporary seeding. It consists of planting rapid-growing annual grasses or small grains, to provide initial, temporary cover for erosion control.

After spreading the topsoil on disturbed areas, it must be ensured that topsoil is seeded, and mulched within 30 days of final grading. During construction, if erosion occurs from stockpiles due to their location in small drainage paths, the sediment-laden runoff should be prevented from entering nearby watercourses. The Concessionaire shall preserve the stockpile material for later use on slopes or shoulders as instructed by the Independent Engineer.

Vegetative material for stockpile stabilisation...

Must consist of grasses, legumes, herbaceous, or woody plants or a mixture thereof • Selection & use of vegetative cover to take into account soil and site characteristics such as drainage, pH, nutrient availability, and climate to ensure permanent growth

Vegetative material for stockpile stabilisation...

Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur.

Divert runoff around stockpiles unavoidably located in drainage paths using a perimeter bank uphill.

The stockpiles shall be covered with gunny bags or tarpaulin immediately in case they are not stored for periods longer than 1 month

5. POST CONSTRUCTION STAGE

The topsoil shall be re-laid on the area after taking the borrow earth to maintain fertility of the agricultural field, finishing it to the required levels and satisfaction of the farmer. The area to be covered with

vegetation shall be prepared to the required levels and slope as detailed in the DPR. The stockpile material shall be spread evenly to a depth of 5-15cm to the designed slopes and watering the same as required. The growth of the vegetation shall be monitored at frequent intervals. All temporary arrangements made for stockpile preservation and erosion control are to be removed after reusing the stockpile material. The top soil can also be used for the following purposes:

- a. Covering the borrow areas;
- b. Embankment and turfing;
- c. Median; and
- d. Rehabilitation of construction and labour camp.

GUIDELINE-5: QUARRY MANAGEMENT**1. INTRODUCTION**

This guideline pertains to the measures to be taken to address environmental concerns in quarry areas. The general practice adopted is to procure materials from existing quarries operating with the requisite permits. The measures to be taken for operation and management for quarries during all stages of construction have been discussed in this Guideline.

2. PROJECT PLANNING AND DESIGN STAGE

The PIU shall provide in the DPR / bid document, a list of licensed quarries operating within the district and adjoining districts. In addition, the DPR shall contain the following: (i) Quantity of materials available in quarries (ii) Lead from the various existing quarries and (iii) Adequacy of materials for the project in these quarries. **Table 5-1** and **5-2** give the format for preparing a list of quarries.

Table 5-1 Details of Sand Quarry

| Sample No. | Source of Sand | Name of quarry area | Site Identification/ Location | | | Approximate Quantity (cum) | Approximate basic cost of the material (Rs.) | Remarks |
|------------|----------------|---------------------|-------------------------------|------------|-----------------------------------|----------------------------|--|---------|
| | | | Nearest Chainage (Km.) | Left/Right | Offset from nearest chainage (km) | | | |

Table 5-2 Details of Quarry Area for Aggregates

| Sample No. | Chainages (Km.) | Left/Right | Name of Quarry Area | Name of Crusher | Lead from nearest chainage (Km.) | Basic cost of the material (Rs.) | Available land/terrain | Surrounding land Terrain | Remarks |
|------------|-----------------|------------|---------------------|-----------------|----------------------------------|----------------------------------|------------------------|--------------------------|---------|
|------------|-----------------|------------|---------------------|-----------------|----------------------------------|----------------------------------|------------------------|--------------------------|---------|

Only in the event of non-availability of existing quarries, the Concessionaire shall open a new quarry in accordance with Mines and Minerals (Development & Regulation) Act, 1957. The bid document shall include the exhaust quarry reclaim plan per needs of the landowner / community.

3. PRE-CONSTRUCTION STAGE

The Concessionaire shall select an existing licensed quarry identified in DPR for procuring materials. The Concessionaire shall establish a new quarry with the prior consent of the Independent Engineer only in cases when: (i) Lead from existing quarries is uneconomical and (ii) Alternative material sources are not available. The Concessionaire shall prepare a Redevelopment Plan for the quarry site and get it approved by the Independent Engineer.

The construction schedule and operations plans to be submitted to the Independent Engineer prior to commencement of work shall contain a detailed work plan for procuring materials that includes procurement, transportation and storage of quarry materials.

4. CONSTRUCTION STAGE**4.1 Development of Quarry Area**

To minimize the adverse impact during excavation of material following measures are need to be undertaken:

- Adequate drainage system shall be provided to prevent the flooding of the excavated area
- At the stockpiling locations, the Concessionaire shall construct sediment barriers to prevent the erosion of excavated material due to runoff.
- Construction of offices, laboratory, workshop and rest places shall be done in the up-wind of the plant to minimize the adverse impact due to dust and noise.
- The access road to the plant shall be constructed taking into consideration location of units and also

slope of the ground to regulate the vehicle movement within the plant.

- In case of storage of blasting material, all precautions shall be taken as per The Explosive Rules, 1983.

4.2 Setting up of Crushers and other equipments

The following measures shall be undertaken for setting up of crushers and other equipments.

- The Concessionaire shall obtain “No Objection Certificate (NoC)” from the Gujarat State Pollution Control Board.
- All vehicles must possess Pollution Under Control (PUC) Certificate and shall be renewed accordingly
- All machinery, equipments, and vehicles shall comply with existing CPCB noise and emission norms.
- The Independent Engineer must ensure that Concessionaire shall submit the copy of NoC and PUC Certificate before the start of work.

4.3 Quarry operations

The following precautions shall be undertaken during quarry operations. vii) Overburden shall be removed and disposed as per **Guideline 8** “Waste Management and Debris Disposal”.

- During excavation slopes shall be flatter than 20 degrees Guideline 8 on to prevent their sliding
- In case of blasting, the procedure and safety measures shall be taken as per The Explosive Rules, 1983
- The Concessionaire shall ensure that all workers related safety measures shall be done as per measures for, “Labour & Workers Health & Safety” (**Guideline 12**).
- The Concessionaire shall ensure maintenance of crushers regularly as per manufacturer’s recommendation.
- Stockpiling of the excavated material shall be done as per stockpiling of topsoil explained in **Guideline 4**, “Topsoil Salvage, Storage & Replacement.”
- During transportation of the material, measures shall be taken as per **Guideline 11** “Construction Plants and Equipment Management” to minimize the generation of dust and to prevent accidents
- The Independent Engineer and the concerned authority shall review the quarry site for the management measures during quarry operation, including the compliance to pollution norms.

5. POST CONSTRUCTION STAGE

A quarry redevelopment plan shall be prepared by the Concessionaire. All haul roads constructed for transporting the material from the quarries to construction site shall be restored to their original state.

The Independent Engineer and the concerned authority shall be entrusted the responsibility of reviewing the quarry site for the progress of implementation of Redevelopment Plan.

The plan shall include:

- Photograph of the quarry site prior to commencement
- The quarry boundaries as well as location of the materials deposits, working equipments, stockpiling, access roads and final shape of the pit.
- Drainage and erosion control measures at site
- Safety measures during quarry operation
- Design for redevelopment of exhaust site.

Two options for redevelopment of quarry areas are given below:

Option A: *Vegetating the quarry to merge with surrounding landscape.* This is done by conserving and reapplying the topsoil for the vegetative growth.

Option B: *Developing exhausted quarries as water bodies.* The pit shall be reshaped and developed into pond, for harvesting rainwater. This option shall only be considered where the location of quarry is at the lowest point, i.e. surrounding areas/ natural drainage slopes towards it.

GUIDELINE-6: WATER FOR CONSTRUCTION

1. INTRODUCTION

The scope of this guideline includes the procurement of water required for construction of roads. Except bituminous works, water is required during all stages of road construction such as Embankment Sub-Grade; Granular sub-base (GSB) and Water Bound Macadam (WBM). Management of water in various stages of construction is given in the following sections.

2. PROJECT PLANNING & DESIGN STAGE

- The Detailed Project Report for both road constructions shall contain the following information:
- Estimate of water requirement during different seasons based on construction schedule of various stages of construction.
- Identification of potential sources of water for construction,
- Arrangements to be worked out by the Concessionaire with individual owners, when water is obtained from private sources, and
- Whether scarcity of water would have any impact on schedule of construction.

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

- Exploring possibilities for use of existing perennial sources, through interactions with water user groups as the villagers, relevant Government Departments, keeping in view that the water extraction does not infringe upon the usufruct rights of the existing water users.
- Identification of potable water source for domestic use of workers and for use in cement - based construction such as cement concrete roads, culverts and other cross drainage works.
- Identification of alternate water sources, water-harvesting techniques will be explored to avoid water extraction from the existing community sources.

In water scarce regions, if water-harvesting structures are to be constructed, suitable locations and mechanism for siting these structures will be identified. These are envisaged to be permanent water tanks for collection of stream water. Detailed drawings of water harvesting structures based on site conditions will need to be worked out and presented in the DPR. No extra payment shall be generally made for these works and the Concessionaire has to include the cost of these items in his offer while quoting his tendered rate.

Scheduling Construction in Water Scarce Areas: As part of the project preparation, the Independent Engineer shall conduct an assessment of water requirement and availability in water scarce regions. As far as possible, schedule for construction in these water scarce areas shall be prepared such that earthwork for embankment is carried out just before monsoon, so that water requirement for subsequent construction works such as granular sub-base and water bound macadam are met in monsoon and post monsoon season. Carrying out these activities even during the monsoon is possible as the rainfall may not be high enough to disrupt construction.

3. PRE-CONSTRUCTION STAGE

Prior to commencement of extraction of water for construction, the Concessionaire shall work out arrangements as specified in the DPR.

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

- Exploring possibilities for use of existing perennial sources, through interactions with water user groups as the villagers, relevant Government Departments, keeping in view that the water extraction does not infringe upon the usufruct rights of the existing water users.
- Identification of potable water source for domestic use of workers and for use in cement - based construction such as cement concrete roads, culverts and other cross drainage works.
- Identification of alternate water sources, water-harvesting techniques will be explored to avoid water extraction from the existing community sources.
from any septic tank/soak pit or other source of pollution.
- **In case of water harvesting structures** (if required), the Contractor shall in consultation with the residents, identify suitable locations for siting the structure and construct the same.
- **In case of perennial sources**, the Contractor shall adhere to all administrative procedures pertaining to procurement of water from such sources.

CONSTRUCTION STAGE

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

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

GUIDELINE-7: SLOPE STABILITY AND EROSION CONTROL

1. INTRODUCTION

Stability of slopes is a major concern in locations of high embankment. In cases of high embankment, water retention at the embankment base initially causes toe failure and subsequently failure of the whole embankment. Soil erosion is consequent to high runoff on hill slopes. Embankments made up of silty and sandy soils get eroded, in the absence of vegetative cover, when the slopes are steep say more than 20 Degree.

The scope of this guideline includes measures to minimize the adverse environmental impacts due to slope instability and soil erosion. The adverse environmental impact can be: (i) Damage to adjacent land, (ii) Silting of ponds and lakes disturbing the aquatic habitat (iii) Erosion of rich and top fertile top layer of soil (iv) Contamination of surface water bodies and (v) Reduction in road formation width due to erosion of shoulders/berms.

2. PROJECT PLANNING AND DESIGN STAGE

During the detailed project preparation phase, the following investigations shall be carried out prior to finalisation of alignment.

- Topographical;
- Hydrological;
- Geo-technical; and
- Geological Investigation (in case of roads in hill areas and areas of high seismic activity)

In addition to the slope stability analysis the alignment should be such that (i) steep as well as heavy cuts are avoided, (ii) Flora and fauna of the area are not disturbed and (iii) Natural drainage pattern is not obstructed.

For high embankments, geo-technical investigations (determination of C, ϕ , density etc.) of the available material need to be done to check its suitability as fill material.

In case of the CD structures, measures for preventing siltation and scouring shall be undertaken as per Guideline on, "Drainage".

Following guidelines shall be followed in desert areas while using cohesion-less soils for embankment construction.

- The alignment should follow the natural ground level to the extent possible and the embankment shall be restricted to minimum to achieve ruling grades.
- Slope of the embankment should be 3 (H): 1(V) or flatter.
- The corners of the embankment should be rounded for better aerodynamic performance.

3. PRE-CONSTRUCTION STAGE

Interceptor ditches are constructed along hilly slopes or areas with high rainfall to protect the road bench and hillside slope from erosion due to heavy rainfall and runoff. Interceptor ditches are very effective in the areas of high intensity rainfall and where the slopes are exposed. These are the structures designed to intercept and carry surface run-off away from erodible areas and slopes, thus reducing the potential surface erosion. The Independent Engineer must ensure that the layout and siting of ditches is as per specifications.

4. CONSTRUCTION STAGE

When alternative material such as fly ash is used for embankment formation, it needs to be ensured that sufficient filter bed is provided along with the top cap. All tests as per IS: 2720 (Parts: 4, 5, 8 & 40) and IRC: SP: 20-2002 are to be conducted on the embankment to keep a check on the compaction achieved. Slope stabilisation techniques and erosion control measures such as vetiver grass, stone pitching, use of geotextile and turfing.

Box-I: Detailed specifications for Vegetative cover

Description:

The vegetative cover should be planted in the region where the soil has the capacity to support the plantation and at locations where meteorological conditions favours vegetative growth.

Site Preparation:

- To prevent the seeds from being washed away subsequent to sowing, the area should be protected with surface roughening and diversions.
- Soil samples should be taken from the site and analysed for fertiliser and lime requirements.

Seed Application:

- The seed should be sown uniformly as soon as preparation of the seedbed has been completed.
- No seed should be sown during windy weather. The best time for seeding would be during monsoon.

Maintenance:

During first six weeks, the planting should be inspected by the PIC, to check if the growth is uniform and dense. Appropriate moisture levels shall be maintained. There may be requirement of watering the plantings regularly during the dry seasons.

5. POST CONSTRUCTION STAGE

All the exposed slopes shall preferably be covered with vegetation using grasses, brushes etc. Locally available species possessing the properties of (i) good growth (ii) dense ground cover and (iii) deep root shall be used for stabilization.

In case of steep and barren slopes, in order to retain the seedling to the ground asphalt mulch treatment shall be given. Seedling are covered with asphalt emulsion and spread into a thin layer. The asphalt film gradually disintegrates and a carpet of green vegetation and deep-rooted species of grass and clovers, takes its place. Anchoring shall be carried out as per IRC: SP: 48-1998.

Regular inspection of check dams and repositioning/replacement of dislodged or stolen stones need to be carried out.

Repair and maintenance of eroded side drain inverts is to be done in order to arrest retrogradation of levels in side drains. Slopes of high embankment can give a fertile base for growth of vegetative cover / sodding.

In arid areas, in order to avoid the deposition of sand over or near the road surface, shrubs are to be planted at an appropriate distance from the formation. The shrubs should not be abutting the road and the distance for carrying out plantation shall be determined based on prevalent wind speeds as well as quantity of sand being carried amongst various other factors. There should be a clear gap between the roadway and shrubs to allow the wind to pick up its velocity and carry along with it any sand that is deposited.

GUIDELINE-8: WASTE MANAGEMENT AND DEBRIS DISPOSAL

1. INTRODUCTION

This guidance describes procedures for handling, reuse and disposal of waste materials during road construction. The Guideline describes waste management measures in all stages of construction. Also, the Guideline discusses the measures to be taken for debris disposal.

2. PROJECT PLANNING AND DESIGN STAGE

As part of DPR preparation, the Independent Engineer shall carry out the following measures

- Finalize road design and alignment to minimize waste generation through balancing of cut and fill operations and minimizing excess cuts requiring disposal.
- Identify the type of wastes as well as sources of waste during construction and suggest options for possible reuse
- Provide guidelines to the Concessionaire for locating waste disposal sites for non-toxic wastes
- Identify existing landfill sites if available for disposal of toxic materials.
- In case no existing landfill sites are available, identification of landfill site as well as identification of the clearance requirements.
- Identify sites of disposal of debris.

3. PRE-CONSTRUCTION STAGE

The Concessionaire shall identify the activities during construction, that have the potential to generate waste and work out measures for reducing, reusing and proper disposing of the generated waste in the construction schedule to be submitted to the Independent Engineer. A sequential listing of the activities during road construction and the nature of wastes together with the possible options for reuse are specified in **Table 8-1**. For the disposal of excess cut and unsuitable (non-toxic) materials, the Concessionaire shall identify the location for disposal in consultation with the community / concerned department. Any toxic materials shall be disposed in existing landfill sites that comply with legislative requirements. Prior to disposal of wastes onto private/community land, it shall be the responsibility of the Concessionaire to obtain a No-objection Certificate (NOC) from the land owner/community. The NOC shall be submitted to the Independent Engineer prior to commencement of disposal.

The Concessionaire shall educate his workforce on issues related to disposal of waste, the location of disposal site as well as the specific requirement for the management of these sites.

Practices to avoid – waste disposal ...

- Tipping of waste into stream channels, water bodies, forests and vegetated slopes
- Non-cleaning of wastes after day's work
- Leaching of wastes
- Littering in construction camps / sites
- Storing wastes on private land

4. CONSTRUCTION STAGE

The Concessionaire shall either reuse or dispose the waste generated during construction for roads depending upon the nature of waste, as specified in **Table 1**. The reuse of waste shall be carried out by the Concessionaire only after carrying out the specific tests and ascertaining the quality of the waste materials used, and getting the same approved by the Independent Engineer. Wastes that were not reused shall be disposed off safely by the Concessionaire. The Concessionaire shall adopt the following precautions while disposing wastes:

- Bituminous wastes shall be disposed off in 60mm thick clay lined pits and covered with 30cm good earth at top, so as to facilitate growth of vegetation in long run.
- In case of filling of low-lying areas with wastes, it needs to be ensured that the level matches with the surrounding areas. In this case care should be taken that these low lying areas are not used for rainwater storage
- In case oil and grease are trapped for reuse in a lined pit, care shall be taken to ensure that the pit should be located at the lowest end of the site and away from the residential areas.

The waste management practices adopted by the Concessionaire, including the management of wastes at construction camps etc shall be reviewed by the Independent Engineer and the Pollution Control Board (PCB) during the progress of construction.

5. POST CONSTRUCTION STAGE

On decommissioning of construction sites, the Concessionaire shall hand over the site free of all debris/wastes to the satisfaction of Independent Engineer. In case of any temporary disposal of wastes on private land, certificate of Completion of Reclamation is to be obtained by the Concessionaire from the landowner that “the land is restored to his satisfaction”. The same is to be submitted to the Independent Engineer before final payment is claimed.

Table 8-1: Type of wastes and scope for reuse- road construction

| S. No | Activity | Type of waste | Scope for possible reuse | Disposal of waste |
|------------------------------|--|---|---|------------------------------------|
| I CONSTRUCTION WASTES | | | | |
| 1. | Site Clearance and grubbing | Vegetative cover and top soil Unsuitable material in embankment foundation | Vegetating embankment slopes Embankment Fill | Low lying areas Land fill sites |
| 2. | Earthworks | | | |
| a) | Overburden of borrow areas | Vegetative cover and soil | Vegetating embankment slopes | |
| b) | Overburden of quarries | Vegetative cover and soil Granular material | Vegetating embankment slopes Embankment Fill, Pitching | |
| c) | Accidental spillages during handling | Dust | | |
| d) | Embankment construction | Soil and Granular Material | Embankment Fill | |
| e) | Construction of earthen drains | Soil | Embankment Fill | |
| 3. | Concrete structures Dust | | | |
| a) | Storage of material | Dust, Cement, Sand Metal Scrap | Constructing temporary structure, embankment fill | Scrap Yard |
| b) | Handling of materials | Dust | | |
| c) | Residual wastes | Organic matter Cement, sand Metal scrap | Manure, Revegetation Constructing temporary structure, embankment fill Diversion sign, Guard Rail | |
| 4 | Reconstruction works | | | |
| a) | Dismantling of existing pavement | Bitumen Mix, granular material Concrete Guard rail sign post, guard stone | sub-base Road Sub-base, reuse in concrete, fill material and as rip rap on roads Reuse for same | |
| b) | Dismantling of cross drainage structures | Granular material & bricks Metal scrap Pipes | Constructing temporary structure, embankment fill Diversion sign, Guard Rail Culvert Culvert | |
| 5 | Decommissioning of sites | | | |
| a) | Dismantling of temporary structures | Granular material and bricks | Constructing temporary structure, embankment fill | |
| 6 | Maintenance operation | | | |
| a) | Desilting of side drains | Organic matter and soil | Revegetation | |
| II OIL AND FLUIDS | | | | |
| 1 | Construction machinery – maintenance and refueling | Oil and Grease | Incineration, Cooking, Illumination | |
| 2 | Bituminous works | | | |
| a) | Storage | Bitumen | Low Grade Bitumen Mix | |

| S. No | Activity | Type of waste | Scope for possible reuse | Disposal of waste |
|----------------------------|-------------------------|-------------------------|---------------------------------------|-------------------|
| b) | Mixing and handling | Bitumen | Low Grade Bitumen Mix | |
| | | Bitumen Mix | Sub-base, Paving access & cross roads | |
| c) | Rejected bituminous mix | Bitumen Mix | Sub-base, Paving access & cross roads | |
| III DOMESTIC WASTES | | | | |
| 1 | Construction camps | Organic waste, | Manure | |
| | | Plastic and metal scrap | | Scrap Yard |
| | | Domestic effluent | Irrigation | |

6. Disposal of Debris

For the purpose of disposal of debris, dumping sites need to be selected. The criteria for selection of dumping sites include:

- No residential areas are located downwind side of these locations;
- Dumping sites are located at least 1000 m away from sensitive locations;
- Dumping sites do not contaminate any water sources, rivers etc; and
- Dumping sites have adequate capacity equal to the amount of debris generated;
- Public perception about the location of debris disposal site has to be obtained before finalizing the location;
- Permission from the Village Panchayat is to be obtained for the dumping site selected;
- Productive lands are avoided; and
- Available waste lands shall be given preference

GUIDELINE-9: WATER BODIES

1. INTRODUCTION

Water bodies may be impacted when the road construction is adjacent to it or the runoff to the water body is affected by change of drainage pattern due to construction of embankment. The following activities are likely to have an adverse impact on the ecology of the area:

- Earth moving;
- Removal of vegetation;
- Vehicle/Machine operation and maintenance;
- Handling and laying of asphalt; and
- Waste disposal from construction camps.

2. PROJECT PLANNING AND DESIGN STAGE

All efforts are to be taken to avoid the alignments passing adjacent or close to water bodies. Where possible, it should be realigned away from the water body without cutting its embankment, decreasing the storage area or impairing the catchment area. Adequate drainage arrangements as per IRC guidelines have to be provided. Stream bank characteristics and hydrology of the area are to be studied before finalizing the alignment, the profile and cross-drainage structures.

Impacts on water bodies impairs ...

- Change in Catchment area of the water body
- Drainage system
- Flood level and water logging
- Flora and fauna dependant on the water body
- Ground water recharging
- Animal husbandry as water bodies are used by animals
- Water quality &
- Runoff (increase/decrease)

Complete filling of water body with soil is not contemplated in the project. The DPR and its cost estimates have to accommodate costs of rehabilitation (to be estimated as lump sum at DPR stage) of water bodies impacted by the project. Water body rehabilitation shall be as per the Rehabilitation Plan prepared by the Concessionaire which should have approval of the Independent Engineer. Details of the tasks to be performed as per the sequence of activities during the project planning and design are as follows:

- Consultations with the people regarding alternate routes that were devised to avoid the pond. If alternate routes are not available, consent of the villagers is to be sought for affecting the pond and also the measures that would be taken to mitigate the impacts.
- Final design is to be prepared indicating the pond location in the alignment drawings.
- If impacting the pond, the extent of impact is to be clearly indicated on a separate drawing showing blown up portion of the pond. The drawing should aid the Concessionaire in setting up exact lines for cutting the pond.
- All necessary measures for mitigation of impacts and precautionary measures while working close to the water body are to be incorporated into the DPR and cost estimates. The measures to be incorporated shall be as per this guideline.

PRE-CONSTRUCTION STAGE

The Concessionaire after an assessment of the likely impacts on the water body and review of the provisions of this guideline shall prepare a detailed work plan at the pre-construction stage. The Concessionaire shall prepare a Rehabilitation Plan for rectifying the likely impact to be caused and approval of Independent Engineer shall be sought prior to commencement of work. The Rehabilitation Plan should include:

- Locations of erosion protection works and silt fencing to prevent sediment laden runoff entering the water body;
- Location of side drains (temporary or otherwise) to collect runoff from the embankment before entering the water body in accordance with IRC guidelines;
- Work program in relation to the anticipated season of flooding/overflowing of the water body;
- Obstructions likely to cause temporary flooding and information to seek clearance to remove the obstruction; and
- Drawings in Rehabilitation Plan should indicate the landscape details along with species to be planted in the surrounding environs of the water body.

The rehabilitation of water body should be with the objective of restoring it to its original state or to a better state with necessary enhancement of its environs. Rehabilitation Plan shall include:

- Reconstruction and stabilization of embankment in case it is impacted;
- If storage area is lost, then the water body is to be deepened to regain an equivalent volume;
- Further enhancement of the water body as a focal point with place for seating and provision of shade; and
- Costs of rehabilitation

Concurrence of the community has to be sought on the Rehabilitation Plan prepared by the Concessionaire. Concerns of the community have to be incorporated into the plan before submitting it for approval of the Independent Engineer.

The Independent Engineer shall scrutinize the Rehabilitation Plan, verify the implementation on site and finally approve the plan. The Rehabilitation Plan should be implemented by the Concessionaire immediately after completion of construction at the stretch near the water body.

| Working near Water Bodies – Precautions | |
|--|---|
| • | Avoid locating roads on pond embankment |
| • | Collect road runoff before entering the water bodies |
| • | Runoff to be filtered of sediments before letting into water bodies |
| • | Avoid debris disposal into water bodies |
| • | Avoid disposal of oil/grease/other contaminants into water bodies |

When there is interruption to regular activities of villagers near water body due to construction or rehabilitation work, following are the Concessionaire’s responsibilities:

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

3. CONSTRUCTION STAGE

It should be ensured by the Concessionaire that the runoff entering the water body is free from sediments. Silt fencing and/or brush barrier shall be installed in the drainage channels for collecting the sediments before letting them into the water body. Silt/sediment should be collected and stockpiled for possible reuse as surfacing of slopes where they have to be revegetated. Cutting of embankment reduces the water retention capacity and also weakens it, hence:

- The Concessionaire should ensure that the decrease in water retention should not lead to flooding of the construction site and surroundings causing submergence and interruption to construction activities.
- Any perceived risks of embankment failure and consequent loss/damage to the property shall be assessed and the Concessionaire should undertake necessary precautions as provision of toe protection, erosion protection, sealing of cracks in embankments. Failure to do so and consequences arising out of embankment failure shall be the responsibility of the Concessionaire. The Independent Engineer shall monitor regularly whether safe construction practices near water bodies are being followed.

Alternate drain inlets and outlets shall be provided in the event of closure of existing drainage channels of the water body. Movement of machinery and workforce shall be restricted around the water body, and no waste from construction camps or sites shall be disposed into it.

4. POST CONSTRUCTION STAGE

With the completion of construction, the Independent Engineer has to ensure implementation of rehabilitation/restoration plan for the water body, as indicated by the Concessionaire in the bid submission. The precincts of the water body have to be left clean and tidy with the completion of construction. Drainage channels of adequate capacity shall be provided for the water body impacted.

GUIDELINE-10: DRAINAGE

1. INTRODUCTION

Inadequate and faulty drainage arrangements during road construction result in obstruction to natural drainage pattern. The problem is further aggravated in the low-lying areas and flood plains receiving high intensity rainfall, which can lead to the instability of embankment, damage to pavement, sinking of foundation, soil erosion, safety hazards and disruption in traffic. Provision of cross-drainage and longitudinal drainage increases the life of the road and consequently reduces water logging and related environmental impacts. The functioning of the drainage system is therefore a vital condition for a satisfactory road.

However, construction or upgradation of CD structures and longitudinal drains is likely to increase sediments, scour the banks, change water level and flow, and also affect the ecology of the surrounding area. The guideline shall address the environmental concerns related to drainage aspects during different stages of the project execution.

2. PROJECT PLANNING AND DESIGN

Drainage shall be broadly divided as (i) Cross-Drainage and (ii) Longitudinal Drainage both surface & subsurface drainage. The alignment shall be routed such that minimum drainage crossings are encountered. Also the geometric design criteria as per IRC 73, guidelines for effective surface drainage should be ensured.

All drains crossing the alignment shall be identified on site and marked on map while undertaking transect walk. Basic information on the width of channel, frequency of traffic holdup and flow would provide inputs into screening of alternate alignments as well as fixing the alignment. Consultations with the community shall provide information on the HFL in the area.

In areas of high and medium intensity rainfall (>400 mm/year), flood prone areas and hilly areas, detailed hydrological studies will need to be conducted. The studies shall be conducted as per IRC: SP-13: 1973 “Guidelines for the Design of Small Bridges & Culverts” and IRC: SP-33:1989 “Guidelines on Supplemental Measures for Design, Detailing & Durability of Important Bridge Structures”.

Design of cross-drainage structures shall be based on the inputs from the hydrological studies as per clause 12.2.3 and in other areas, the C-D structure design shall be as per IRC: SP-13. Design of C-D structure shall be such that:

- Normal alignment of the road is followed even if it results in a skew construction of culverts and stream bank protections are incorporated.
- Afflux generated is limited to 30 cm in plains with flat land slopes.
- It is fish friendly – fish passage is not interrupted either in upstream or downstream direction.
- Adequate scour protection measures for stream bank, roadway fill as head walls, wing walls and aprons are included.
- Reinforced road bed (of concrete or rock) for protection against overflow in case of low water crossing (floods/causeways) is included.
- The design of C-D structure (minor and major bridge) should have stairs leading to the bed of the drainage channel, for regular inspection of the sub-structure.
- Schedule of construction of C-D structures should be confined to dry months to avoid contamination of streams.

Longitudinal drains are to be designed to drain runoff from highest anticipated rainfall as per rainfall data for the past 20 years or 50 years as per hydrological analysis in high rainfall areas (annual rainfall > 1000 mm) and hill areas. For design of longitudinal drains in other areas, the design shall be as per IRC: SP-20:2002.

Outfall of the roadside drains shall be into the nearby stream or culvert. The outfall should be at such a level that there would be no backflow into the roadside drain. Wherein pond/low lying areas exist in the vicinity, the flow may be diverted into them after removal of sediment for possible ground water recharge.

In case of high embankment (>1.0m) or bridge approaches, lined channels shall be provided to drain the surface runoff, prevent erosion from the slopes and avoid damage to shoulders and berms. Detailed specifications shall be as per IRC: SP-20:2002. The type of drains that can be constructed include bricklined, pucca with RCC, covered drain with RCC slabs and piped drain.

3. PRE-CONSTRUCTION STAGE

Following measures are to be undertaken by the Concessionaire prior to the commencement of CD/Bridge construction:

- The downstream as well as upstream user shall be informed one month in advance
- The Concessionaire shall schedule the activities based on the nature of flow in the stream.
- The Concessionaire should inform the concerned departments about the scheduling of work. This shall form part of the overall scheduling of the civil works to be approved by Independent Engineer.
- Erosion and sediment control devices are to be installed prior to the start of the civil works.
- Interceptor drains to be dug prior to slope cutting to avoid high runoff from slopes entering construction sites in case of hill roads
- Runoff from temporary drains and interceptor drains to be directed into natural drains in hill roads
- In case of up-gradation of the existing CD Structures, temporary route / traffic control shall be made for the safe passage of the traffic, depending upon the nature of the stream
- All the safety/warning signs are to be installed by the Concessionaire before start of construction

In case of utilization of water from the stream, for the construction of the CD structures, the Concessionaire has to take the consent from the concerned department (refer Guideline on “Water for Construction”)

4. CONSTRUCTION PHASE

Drainage structures at construction site shall be provided at the earliest to ensure proper compaction at the bridge approach and at the junction of bridge span and bridge approach. Velocity of runoff to be controlled to avoid formation of rills/gullies as per guideline, “Slope stability & erosion control”

While working on drainage channels, sediment control measures shall be provided. Silt fencing (as per the detailed specifications of guideline, “Slope Stability & Erosion Control”) shall be provided across the stream that carries sediment.

The sediments collected behind the bunds shall be removed and after drying, can either be reused or disposed off as per guideline, “Waste Management and Debris Disposal”. Safety devices and flood warning signs to be erected while working over streams and canals.

5. POST CONSTRUCTION

Inspection and cleaning of drain shall be done regularly to remove any debris or vegetative growth that may interrupt the flow. HFL should be marked as per hydrological data on all drainage structure. Temporary structure constructed during construction shall be removed before handing over to ensure free flow through the channels. The piers and abutments should be examined for excessive scour and make good the same if required. The upstream and downstream areas should be cleared of all CD works.

In case of Causeway following aspect shall be taken into consideration:

- Dislocation of stones in stone set pavements, scouring of filler material due to eddy currents.
- Floating debris block the vents. In case of large amount of floating material, debris arrestor shall be provided in upstream side.
- Damage to guide stones, information board shall be inspected and replaced accordingly.

Schedule of Inspection shall be drawn up for checking cracks, settlements and unusual backpressures. It must be ensured that all the rectification shall be undertaken as and when required. Following are broadly the items to be checked:

- Settlement of piers/abutments & settlement of approach slabs have to be checked;
- Cracks in C-D structures or RCC slabs;
- Drainage from shoulders to be ensured;
- Ditches & drains to be kept clean of debris or vegetation growth; and
- Repairs to parapet of culverts whenever required are to be undertaken.

GUIDELINE-11: CONSTRUCTION PLANTS & EQUIPMENT MANAGEMENT

1. GENERAL

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

2. PROJECT PLANNING AND DESIGN STAGE

Selection criteria for setting up a plant area and parking lot for equipments and vehicles shall be done as per siting criteria for construction camp specified in Guideline on “Construction and Labour Camps”.

3. PRE-CONSTRUCTION STAGE

The Concessionaire must educate the workers to undertake safety precaution while working at the plant / site as well as around heavy equipments. Before setting up the crusher, hot-mix plant and generator, the Concessionaire shall acquire “No Objection Certificate (NOC)” from the Gujarat State Pollution Control Board for the same. The Concessionaire shall ensure all vehicles must possess Pollution under Control (PUC) Certificate, which shall be renewed regularly. The Concessionaire must ensure that all machinery, equipments, and vehicles shall comply with the existing Central Pollution Control Board (CPCB) noise and emission norms. The Independent Engineer must ensure that the Concessionaire shall submit a copy of the NOC and PUC Certificates before the start of work. The Concessionaire shall design the service road with protection measures as black topping at vulnerable points as in low lying areas.

4. CONSTRUCTION STAGE

The Concessionaire shall undertake measures as per **Table 11-1** to minimize the dust generation, emissions, noise, oil spills, residual waste and accidents at the plant site as well as during transportation of material to construction site.

Table 11-1: Measures at Plant Site

| Concern | Causes | Measures |
|-------------------------|-----------------------------|--|
| Dust Generation | Vehicle Movement | <ul style="list-style-type: none"> •Water sprinkling •Fine Materials shall be Transported in Bags or Covered by Tarpaulin during Transportation •Tail board shall be properly closed and sealed to be spill proof |
| | Crushers | <ul style="list-style-type: none"> •Regular Water Sprinkling to keep the dust below visibility level |
| | Concrete-Mix Plant | <ul style="list-style-type: none"> • Educate the workers to follow/adopt good engineering practices while material handling |
| Emissions | Hot-Mix Plant | <ul style="list-style-type: none"> •Site Selection as per Clause 6.5.2, Section 6.5, IRC’s Manual for Construction & Supervision of Bitumen Work •Regular maintenance of Dust Collector as per manufacture’s recommendations |
| | Vehicles | <ul style="list-style-type: none"> • Regular maintenance as per manufacture’s recommendation |
| | Generators | <ul style="list-style-type: none"> • Exhaust vent of long length and emission to confirm to PCB norms. |
| | Heavy Load Vehicles | <ul style="list-style-type: none"> • Exhaust silencer, Regular maintenance as per manufacture schedule |
| Noise | Crushers | <ul style="list-style-type: none"> • Siting as per guideline, “Construction and Labour Camps” |
| | Generators | <ul style="list-style-type: none"> • All generators should have mandatorily acoustic enclosures and confirms to PCB norms. |
| Oil Spills | Storage and Handling | <ul style="list-style-type: none"> • Good practice, guideline, “Waste Management and Debris Disposal” |
| Residual waste | Dust Collector and Pits | <ul style="list-style-type: none"> • Guideline , “Waste Management and Debris Disposal” |
| Concrete waste | Concrete-Mix plant | <ul style="list-style-type: none"> • Guideline, “Waste Management and Debris Disposal” |
| Bitumen and bitumen mix | Hot-mix Plant | <ul style="list-style-type: none"> • Guideline, “Waste Management and Debris Disposal” |
| Stone chips | Crushers | <ul style="list-style-type: none"> • Guideline, “Waste Management and Debris Disposal” |
| Safety | Trajectory of Equipments | <ul style="list-style-type: none"> • No worker shall be present in the vicinity of the equipments |
| | Movable Parts of Equipments | <ul style="list-style-type: none"> • Caution Sign, awareness among workers |
| | Plant Area / Site | <ul style="list-style-type: none"> • Caution Sign, Safety Equipments |
| | Accidents / Health | <ul style="list-style-type: none"> •First Aid Box, Periodic Medical Checkup Break down of |
| | Break down of | <ul style="list-style-type: none"> • Arrangement for towing and bringing it to the workshop |

| Concern | Causes | Measures |
|---------|--------|----------|
|---------|--------|----------|

vehicles

During site clearance, all cut and grubbed materials shall be kept at a secured location so that it does not raise any safety concerns. During excavation, water sprinkling shall be done to minimize dust generation. Frequent water sprinkling shall be done on the haul roads to minimize dust generation. In case of loose soils, compaction shall be done prior to water sprinkling. Cautionary and informatory sign shall be provided at all locations specifying the type of operation in progress. The Concessionaire must ensure that there is minimum generation of dust and waste while unloading the materials from trucks. The construction waste generated shall be disposed as per Guideline on, “Waste Management and Debris Disposal”. The equipments, which are required to move forward and backward, shall be equipped with alarm for backward movement. It shall be ensure that the workers shall remain away from the working areas at such times. Also, equipments at construction camp should be barricaded and kept away from residential quarters of workers.

The Independent Engineer shall carry out periodic inspections to ensure that all the pollution control systems are appropriately installed and comply with existing emission and noise norms.

5. POST-CONSTRUCTION STAGE

The Independent Engineer shall ensure that all the haul roads are restored to their original state. In case any inner village road is damaged while transporting the procured material; the Concessionaire shall restore the road to its original condition. The Independent Engineer must ensure that the decommissioning of plant shall be done in environmentally sound fashion and the area to bring its original state.

Designated area refers to paved surfaces and barren parcels of land, with adequate drainage and disposal system. It must be ensure that these are away from agriculture land, water body and other sensitive areas.

Safety Measures During Bitumen Construction Work...

- The Contractor shall ensure that bitumen storing, handling as well as mixing shall be done at hot-mix plant or designated areas¹ to prevent contamination of soil and ground water.
- Skilled labour shall be used while hand placing the pre-mixed bitumen material. The hand placing of pre-mixed bituminous material shall be done only in following circumstances:
 - For laying profile corrective courses of irregular shape and varying thickness
 - In confined spaces where it is impracticable for a paver to operate and
 - For filling potholes
- The Contractor shall provide safety equipments i.e. gumboots and gloves to the workers while handling bitumen.
- While applying Tack Coat, spraying of bitumen shall be done in the wind direction. The labour shall wear jacket while spraying the bitumen.
- All the bituminous work shall be done as per IRC's Manual for Construction and Supervision of Bituminous Works.

GUIDELINE-12: LABOUR AND WORKER'S HEALTH AND SAFETY

1. INTRODUCTION

The safety and health concerns of the workers and the community are impacted due to the hazards created during the construction of road. **Box: 1** gives the safety concerns during construction. This Guideline describes the hazards and measures that need to be taken to mitigate the impacts.

2. PROJECT PLANNING AND DESIGN STAGE

To address health and safety concerns, the DPR shall contain selection criteria for setting up:

- Construction Camps (as per guideline);
- Borrow Areas (as per guideline); and
- In case of opening new quarry areas (as per guideline).

To address the safety concerns to road user during operational phase, the DPR shall contain the following:

- Selection and location of regulatory as well as informatory signs as per IRC: 67-2001, depending upon the geometry of the road.

| Box 1: Safety Concerns during Construction |
|---|
| <p>Community due to:</p> <ul style="list-style-type: none"> • Improper scheduling of construction activities especially near the settlements and sensitive areas; • Parking of equipments and vehicles at the end of the day likely to cause accidents to the general public especially during night hours; • Transportation of uncovered loose material or spillage of material increases the chances of accidents to road users and surrounding settlements. <p>Workers due to:</p> <ul style="list-style-type: none"> • Improper handling of materials like bitumen, oil and other flammable material at construction sites, likely to cause safety concerns to the workers; • Lack of safety measures such as alarm, awareness and safety equipment result in accidents, especially working with or around heavy machinery / equipments. |

PRE-CONSTRUCTION STAGE

In order to incorporate public health and safety concerns, the Independent Engineer and the Concessionaire shall disseminate the following information to the community:

- Location of construction camps, borrow areas and new quarry areas;
- Extent of work;
- Time of construction;
- Diversions, if any;
- Precaution measures in sensitive areas;
- Involvement of local labours in the road construction;
- Health issues - water stagnation, exposure to dust, communicable disease; and
- Mechanism for grievances.

| Health Concerns are adversely impacted..... |
|---|
| <p>Public due to:</p> <ul style="list-style-type: none"> • Unhygienic conditions due to water logging (improper drainage of waste water), either by improper decommissioning of Construction Camps and parking lots, or improper disposal of construction wastes, leading to the breeding of vectors that are likely to impact the health of the general public • Interaction between workers and host community is likely to increase the risk of spread of communicable diseases. <p>Workers due to:</p> <ul style="list-style-type: none"> • Low quality drinking water as well as inappropriate storage of drinking water likely to cause water borne diseases among workers. • Absence of proper sanitary facility likely to act as a breeding ground for vectors raising health concerns among workers. |

The information dissemination could be through the local newspaper, billboards, panchayats meetings, etc. The Concessionaire must educate the workers to undertake the health and safety precautions. The Concessionaire shall educate the workers regarding:

- Awareness on HIV/AIDS awareness and usage of safety measures such as condoms;

- Awareness on hygienic sanitary practices;
- Personal safety measures and location of safety devices;
- Interaction with the host community;
- Protection of environment with respect to:
 - Trampling of vegetation and cutting of trees for cooking;
 - Restriction of activities in forest areas and also on hunting;
 - Water bodies protection;
 - Storage and handling of materials;
 - Disposal of construction waste.

3. CONSTRUCTION STAGE

During the progress of work, following are the safety requirements that need to be undertaken by the Concessionaire at the construction site:

- Personal Protective Equipments (PPE) for the workers. **Table 12-1** gives the safety gear to be used by the workers during each of the construction activities.
- All measures as per bidding document shall be strictly followed.
- Additional provisions need to be undertaken for safety at site:
 - Adequate lighting arrangement;
 - Adequate drainage system to avoid any stagnation of water;
 - Lined surface with slope 1:40 (V:H) and provision of lined pit at the bottom, at the storage and handling area of bitumen and oil, as well as at the location of generator (grease trap); and
 - Facilities for administering first aid.

| FIRST AID FACILITIES |
|---|
| <ul style="list-style-type: none"> • First Aid Kit, distinctly marked with Red Cross on white back ground and shall contain minimum of following: <ul style="list-style-type: none"> ○ 6 small-sterilized dressings ○ 3 medium and large sterilized dressings ○ 1 (30 ml.) bottles containing 2 % alcoholic solution of iodine ○ 1(30 ml) bottle containing salvolatile ○ 1 snakebite lancet ○ 1 pair sterilized scissors ○ 1 copy of first-aid leaflet issued by the Director General, Factory Service & Labour Institute, Government of India ○ 100 tablets of aspirin ○ Ointment for bums ○ A suitable surgical antiseptic solution • Adequate arrangement shall be made for immediate recoupment of the equipments, whenever necessary. • A trained personnel incharge of first aid treatment to be readily available during working hours at construction site • Suitable transport to the nearest approachable hospital should be made available. • Tetanus injection must be made compulsory for all workers every 6 months. |

Table 12-1: Worker Safety Measures

| Sl. no. | Activity | Safety Requirement |
|---------|--|--|
| 1. | Setting out and levelling | <ul style="list-style-type: none"> • Luminous jackets; • Helmets; • Boots for protection against insect bite; and Dust Mask |
| 2. | Tree cutting | <ul style="list-style-type: none"> • Helmet Boots • Luminous safety jackets |
| 3. | Reinforced yard/ carpentry/ reinforcement cutting/ bending work. | <ul style="list-style-type: none"> • Hand gloves |
| 4. | Shuttering work | <ul style="list-style-type: none"> • Goggles Hand gloves • Hand gloves |
| 5. | Plant and Machinery | <ul style="list-style-type: none"> • Boots • Helmets • Dust Mask |
| 6. | Material handling | <ul style="list-style-type: none"> • Hand gloves • Dust mask |
| 7. | Batching plant | <ul style="list-style-type: none"> • Goggles • Hand gloves • Dust mask |
| 8. | Weeding | <ul style="list-style-type: none"> • Goggles |
| 9. | Binding reinforcement | <ul style="list-style-type: none"> • Safety belt • Boots |
| 10. | Manual concrete laying | <ul style="list-style-type: none"> • Gum boots • Hand gloves |

| Sl. no. | Activity | Safety Requirement |
|---------|----------|--|
| 11. | Piling | <ul style="list-style-type: none"> • Helmet • Helmet • Hand gloves, gumboots. |

The following measures need to be adopted by the Concessionaire to address public safety concerns:

- The Concessionaire shall schedule the construction activities taking into consideration factors such as:
 - Sowing of crops;
 - Harvesting;
 - Local hindrances such as festivals etc.; and
 - Availability of labour during particular periods.
- All the cautionary signs as per IRC: 67-2001 and traffic control devices (such as barricades, etc) shall be placed as soon as construction activity get started and shall remain in place till the activities get completed.
- Following case specific measures need to be followed during the progress of the activity:
 - In case of blasting, the Concessionaire must follow The Explosives Rules, 1983.
 - In case of construction activity adjoining the water bodies, measures shall be taken as per measures suggested in Guideline on “Water Body”.
 - If construction of road is within the settlement, the Concessionaire must ensure that there shall not be any unauthorized parking as well as storage of material, adjacent to road.
 - Approved chemicals should be sprayed to prevent breeding of mosquitoes and other disease-causing organisms, at all the water logging areas

The Independent Engineer shall carry out periodic inspections in order to ensure that all the measures are being undertaken as per the guideline.

4. POST-CONSTRUCTION STAGE

During this stage a major concern is on road user safety. Following are the measures that need to be undertaken by the Independent Engineer to ensure safer roads:

- Inspection and maintenance of installed regulatory and informatory signs.
- Ensure that the location of signage does not obstruct the visibility
- In case of hill roads, maintenance of parapet wall as well as of overtaking zones.

The Independent Engineer must ensure that during the maintenance operation of road, road materials are stored at a location such that they shall not create any risk to road users.

The construction site shall be cleaned of all debris, scrap materials and machinery on completion of construction for the safety of public and road users, as per the measures given in Guideline on “Construction and labour Camp” and “Waste Management and Debris Disposal.”

GUIDELINE-13: CULTURAL PROPERTIES

1. INTRODUCTION

The cultural properties located close to the road are likely to be impacted by the road construction. Most of the properties are avoided in general during finalization of alignment. This Guideline discusses the mitigation measures for cultural properties.

2. PROJECT PLANNING AND DESIGN STAGE

Measures for mitigation of impacts on cultural properties during project preparation shall be as per the following steps:

- Identification of locally significant cultural properties should be done;
- Assessment of likely impacts on each cultural property due to project implementation;
- The extent of impact on the identified culture property should be assessed and possible measures for avoidance should be devised based on the site investigation. In case impact is not avoidable, identification of alternative routes or possibility of relocation of the culture property shall be assessed in consultation with the local public, based on the economic feasibility.

In case of relocation, relocated site should be suggested by the local people and the size of relocated structure should at least be equal to the original structure. A written consent letter is to be obtained from the community regarding the relocation site of the cultural property in the form of resolution on the letter pad of the sarpanch/gram panchayat or with the signatures of community members.

A detailed design of the relocated structure and its site plan along with the necessary BoQ are to be presented DPR. The relocation and other avoidance measures should be carried out before the start of the road work

It must be ensured by the Independent Engineer that the BoQ and rates are incorporated into the contract document.

3. CONSTRUCTION STAGE

Major impacts on the properties during this stage are mainly due to movement of construction machinery as well as due to construction activity in the vicinity of the cultural property. Following are precautionary measures that need to be undertaken by the Concessionaire while working near these structures:

- Restrict movement of heavy machinery near the structure
- Avoid disposal or tipping of earth near the structure
- Access to these properties shall be kept clear from dirt and grit

During earth excavation, if any property is unearthed and seems to be culturally significant or likely to have archeological significance, the same shall be intimated to the Independent Engineer. Work shall be suspended until further orders from Independent Engineer. The State Archeological Department shall be intimated of the chance find and the Independent Engineer shall carry out a joint inspection with the department. Actions as appropriate shall be intimated to the Concessionaire along with the probable date for resuming the work.

The Independent Engineer must ensure that the Concessionaire implements the precautionary measures as suggested. Also, the Independent Engineer must conduct monitoring for the cultural property.

| Information to be collected... |
|--|
| • Location |
| • Direction (North/ South/East/West) With Respect to Road |
| • Distance of the structure from existing centerline of the road |
| • Type of Property eg: temple/mosque/shrine/dargah etc |
| • Plan of the structure |
| • Importance of the structure – historical/social/archeological |
| • Ownership of the property |
| • Probable loss to the property |
| • Specific periods/durations in which large congregations as festivals/mela take place causing hindrance to vehicular movement |
| • Choice of community, issue of relocation |

GUIDELINE-14: TREE CUTTING AND AFFORESTATION

This Guideline discusses the issue of tree cutting and afforestation. Loss of trees creates adverse environmental impacts. In order to mitigate these impacts, suitable measures have been suggested as part of this Guideline. These measures have been given for each of the stages of the road construction activities.

1. PROJECT PLANNING AND DESIGN STAGE

During alignment finalisation, due consideration shall be given to minimise the loss of existing tree cover, encroachment of forest areas / protected areas etc as specified in guideline on, "Site preparation". Tree felling, if unavoidable, shall be done only after compensatory plantation of at least three saplings for every tree cut is done.

The plantation/afforestation would be carried out by the forest department. It should be ensured that plantation is carried out only in areas where water can be made available during dry seasons and the plant can be protected during the initial stages of their growth. The species shall be identified giving due importance to local flora (suggested in **Table 14-1**). It is recommended to plant mixed species in case of both avenue or cluster plantation.

The plantation strategy shall suggest the planting of fruit bearing trees and other suitable trees. Development of cluster plantations will be encouraged in the community lands, at locations desired by the community. The choice of species will be based on the preferences of the community. The Independent Engineer shall oversee the plantation to check the following:

- Whether trees are obstructing live of right at junctions;
- Whether trees are at the inside of the junctions;
- Whether trees are within 5 mts of the proposed centerline.

2. POST-CONSTRUCTION STAGE

The maintenance of the saplings (including activities such as weeding, watering, planting of replacement saplings, etc application of manure etc) shall be the responsibility of the forest department. The Independent Engineer shall ensure the following:

- Shoulder of roads to be kept clear of weeds/undesirable undergrowth; and
- Branches of trees do not obstruct clear view of the informatory and cautions signs.

Table 14-1: Endemic Species of Gujarat

| Sl.no | Tree Species Endemic species) | Sl.no | Tree Species Endemic species) |
|-------|---------------------------------|-------|-------------------------------|
| 1 | <i>Tectonagrandis</i> | 9 | <i>Brideliasquamosa</i> |
| 2 | <i>Anogeissuspendula</i> | 10 | <i>Emblicaoofficinallis</i> |
| 3 | <i>Boswelliaserratta</i> | 11 | <i>Buteamonosperma</i> |
| 4 | <i>Acacia nilotica</i> | 12 | <i>Diospyrosmelanoxylon</i> |
| 5 | <i>Euphorbia caducifolia</i> | 13 | <i>Anogeissuslatifolia</i> |
| 6 | <i>Flacourtiaindica</i> | 14 | <i>Lanneacoromandolica</i> |
| 7 | <i>Helicteresisor</i> | 15 | <i>Sterculiaurens</i> |
| 8 | <i>Holarrhenaantidysentrica</i> | 16 | <i>Mitragynaparviflora</i> |

GUIDELINE-15: FORESTS AND OTHER NATURAL HABITATS

1. INTRODUCTION

This guideline envisages measures to be undertaken during blacktopping / widening of road sections passing through natural habitats. These measures shall be undertaken in addition to the measures laid down in the other Guidelines.

Conservation of natural habitats is essential for long-term sustainable development. A precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development has been adopted for the project.

| Natural Habitats means... |
|---|
| <ul style="list-style-type: none"> National Park Reserve Forest Sanctuaries Notified Wetlands Fisheries and Aquatic Habitats |

2. PROJECT PLANNING AND DESIGN

To minimize the adverse impact on the ecology of the natural habitats, selection of alignment should be as per guideline. An officer of at least the rank of a forest ranger shall be deputed for detailed inventory of ecological features along the road. The nature and type of impact on natural habitats due to road construction shall be identified. Magnitude of the impact to the extent feasible on the ecological features shall also be assessed.

| Ecological Features... | Adverse Impacts... |
|--|--|
| <ul style="list-style-type: none"> Area of natural habitat; Type and number of endangered species of flora and fauna; Stream and water bodies; Breeding ground and seasons; Migration season of bird species; and Animal crossing. | <ul style="list-style-type: none"> Diversion of forest land; Cutting of trees; Trampling of vegetation; Contamination of water due to the usage of water from the source within the natural habitat; Loss of breeding grounds; and Interruption to animal crossings during the construction. |

Impacts identified on the natural habitats shall be minimized to the extent required. Minimization shall be through precautionary measures or through appropriate mitigation measures. Following are the measures should be undertaken along the road passing through natural habitats:

- Constricting the road width to 6.0 m and embankment height to 0.5 m to minimize the extent of diversion of forest land and cutting of trees
- Drainage Structures shall be designed strictly in accordance with guideline on “Drainage”.
- Rumble strips shall be provided at every kilometer along the length of the natural habitat and invariably at the start and end of the natural habitat
- Signage (viz. speed limit, animal crossing, switch of headlight etc) shall be provided as per IRC: 67-2001 Code of Practice for road sign (first revision)

In addition to the above measures, specific impacts identified on site shall be mitigated as per the recommendation of the forest department / officer in charge of the identified natural habitat.

In case proposed alignment falls within the catchments of a water body or a stream, a flush causeway shall be constructed without impacting the drainage system. The length of the causeway shall be as per the existing water spread. The causeway shall be strictly in compliance with IRC:SP-20:2002. In no circumstances a water body within the natural habitat shall be cut across or filled for the purpose of laying the road.

3. PRE-CONSTRUCTION STAGE

No Construction Camps, Stockyards, Concrete Batching or Hot Mix Plants shall be located within the natural habitat or within 500m from its boundary.

Concessionaire in consultation with forest ranger or any other concerned authority shall prepare a schedule of construction within the natural habitat. Due consideration shall be given to the time of migration, time of crossing, breeding habits and any other special phenomena taking place in the area for the concerned flora or fauna.

4. CONSTRUCTION STAGE

Procurement of any kind of construction material (as quarry or borrow material) from within the natural habitat shall be strictly prohibited. No water resources within the natural habitat shall be tapped for road construction. Use of mechanized equipment shall be kept minimum within the natural habitat. Concessionaire must ensure that there will be no parking of vehicles machine and equipment within the natural habitat. Disposal of construction waste within the natural habitat shall be strictly prohibited and as far as possible reuse shall be undertaken as per **Table -1** type of waste of guideline, “Waste Management and Debris Disposal”.

5. POST CONSTRUCTION STAGE

The road passing through the natural habitat shall be declared as a silence zone. Compensatory tree plantation within the available Right of Way shall be done in accordance with guideline, on “Tree Cutting and Afforestation”. The Independent Engineer must ensure maintenance of drainage structure shall be undertaken as per guideline, “Drainage”

GUIDELINE-16: AIR AND NOISE POLLUTION

1. INTRODUCTION

This guideline deals with the mitigation of adverse impacts due to air and noise pollution. Both of these have been discussed in the subsequent sections respectively.

2. AIR POLLUTION

The types of air pollution due to construction activities might include generation of dust, emission from hot mix plants and batching plants, odour from construction labour camps, emission from construction machinery/vehicles etc. The measures for mitigation of impacts from each of these are given below.

Generation of Dust

- All vehicles delivering materials to the site shall be covered to avoid spillage of materials.
- The Concessionaire shall take every precaution to reduce the level of dust emission from the hot mix plants and the batching plants up to the satisfaction of the Independent Engineer in accordance with the relevant emission norms.
- All existing highways and roads used by vehicles of the Concessionaire, or any of his sub-Concessionaire or supplies of materials or plant and similarly roads which are part of the works shall be kept clean and clear of all dust/mud or other extraneous materials dropped by such vehicles or their tyres.
- Spillage shall be cleared immediately by manual sweeping and removal of debris or if so directed by the Independent Engineer, by mechanical sweeping and clearing equipment, and all dust, mud and other debris shall be removed completely. Additionally, if so directed by the Independent Engineer, the road surfaces shall be hosed or watered using necessary equipments.
- Plants, machinery and equipment shall be so handled (including dismantling) so as to minimize generation dust.
- All earthwork shall be protected in a manner acceptable to the Independent Engineer to minimise generation of dust.
- The hot mix plant is sited at least 1000m from the nearest habitation. The hot mix plants shall be fitted with dust extraction units in order that the exhausts comply with the requirements of the relevant current emission control legislation.
- Generation of dust should be suppressed during unloading of construction material and also during storage of the construction material.

Emission from Hot-Mix Plants and Batching Plants

- Hot mix plants and batching plants shall be located sufficiently away from habitation, agricultural operations or industrial establishments. Where possible such plants will be located at least 1000m away from the nearest habitation.
- The exhaust gases shall comply with the requirements of the relevant current emission control legislation. All operations at plants shall be undertaken in accordance with all current rules and regulations protecting the environment.

Odour from Construction Labour camps

- Construction labourers camp shall be located at least 500 m away from the nearest habitation.
- The waste disposal and sewerage system for the camp shall be properly designed, built and operated so that no odour is generated. Compliance with the Factory Act, the construction workers (regulation of employment and conditions of service) Act, 1996 and all other relevant legislation shall be strictly adhered to.

Emission from Construction Vehicles, Equipment and Machinery

- The discharge standards promulgated under the Environment Protection Act, 1986 shall be strictly adhered to. All vehicles, equipment and machinery used for construction shall conform to the relevant Indian Standard (IS) norms.
- All vehicles, equipment and machinery used for construction shall be regularly maintained to ensure that pollution emission levels comply with the relevant requirements of SPCB & the

Independent Engineer.

Pollution from Crusher

- All crushers used in construction shall conform to relevant dust emissions control as legislated. Clearance for siting shall be obtained from the SPCB. Alternatively, only crushers already licensed by the SPCB shall be used.
- Dust screening vegetation will be planted on the edge of RoW for all existing roadside crushers.
- If crusher owned by Concessionaire, the suspended particulate matter contribution value at a distance of 40m from a controlled isolated as well as from a unit located in a cluster should be less than 600 ug/Nm^3 . The monitoring is to be conducted at least twice a month for all the 12 months in a year during the crushing operation for the project.

3. NOISE POLLUTION

Noise from Vehicles, Plants and Equipment

- The plants and equipment used in construction (including the aggregate crushing plant) shall strictly conform to the Gol noise standards.
- All vehicles and equipment used in construction shall be fitted with exhaust silences. During routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found to be defective shall be replaced. Notwithstanding any other conditions of contract, noise level from any item of plant(s) must comply with the relevant legislation for levels of sound emission. Non-compliant plant shall be removed from site.
- Noise limits for construction equipment used in this project (measured at one meter from the edge of the equipment in free field) such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws shall not exceed 75 dB(A), as specified in the Environment (Protection) Rules, 1986.
- Maintenance of vehicles, equipment and machinery shall be regular and proper, to the satisfaction of the Independent Engineer, to keep noise from these at a minimum.
- In construction sites within 150 m of the nearest habitation, noisy construction work such as crushing, concrete mixing and batching, mechanical compaction, etc., will be stopped between 2200 hours to 0600 hours. In silence zone (areas up to 100 m around such premises as hospitals, educational institutional and courts) no hot-mix, batching or aggregate crushing plant will be allowed. No construction shall take place within 100m around hospitals between 21.00 hours to 06.00 hours.
- Workers in vicinity of strong noise, and workers working with or in crushing, compaction, batching or concrete mixing operations shall wear earplugs.

Noise from Blasting (or) Pre splitting Operations.

- Blasting shall be carried out only with permission of the Independent Engineer. All the statutory laws, regulators, rules, etc., pertaining to acquisition, transport, storage, handling and use of explosives shall be strictly followed.
- Blasting shall be carried out during fixed hours (preferably during mid-day), as permitted by the Independent Engineer. The timing should be made known to all the people within 500m (200m for pre-splitting) from the blasting site in all directions. People, except those who actually light the fuse shall be excluded from the area of 200m (50m for pre-splitting) from the blasting site in all directions at least 10m minutes before the blasting.

Annexure 7: Bill of Quantities (BoQ)

| Sr. No. | Description | Unit | Phase | Estimated Quantity | Unit Rate (Rs.) | Amount (Rs.) |
|--------------|--|-------|--------------------|--------------------|-----------------|--------------|
| 10.00 | Implementation of Environmental Management Action Plan to be executed under Civil Works Contract | | | | | |
| 10.10 | Periodic air quality monitoring during construction stage at construction camp sites, bitumen hot mix plants, crusher plants (if specifically established for Project), at major settlement areas along project road. The parameters to be monitored are SPM, RPM, SO ₂ , NO _x and CO, Lead. Each monitoring schedule shall be over duration of 24 hours (in 8 hour shifts) for three seasons per year. (as per the Environmental monitoring plan referred in the EMP) | Nr | Construction Phase | 42.0 | 7500.00 | 3,15,000.00 |
| | | | Operation Phase | 90.0 | 7500.00 | 6,75,000.00 |
| 10.12 | Water quality monitoring during construction phase at locations. The sampling shall be carried out for three seasons per year and cover all parameters as per IS10500 including heavy metals. (As per the Environmental monitoring plan referred in the EMP). | Nr | Construction Phase | 36.0 | 6000.00 | 2,16,000.00 |
| 10.13 | Noise quality monitoring at specified silent receptors along Project Road, at construction camp sites, bitumen hot mix plants, crusher plants(if specifically established for Project), and at major settlement areas along project road. – Each monitoring schedule shall be over duration of 24 hours for three seasons per year. (as per the Environmental monitoring plan referred in the EMP)The monitoring shall be carried out in accordance with CPCB norms at locations given. | Nr | Construction Phase | 36.0 | 3000.00 | 1,08,000.00 |
| | | | Operation Phase | 90.0 | 3000.00 | 2,70,000.00 |
| 10.14 | Soil quality monitoring at construction camp sites, work shop areas, oil/lubricant handling areas, bitumen hot mix plants, at all parking lay byes, vehicle servicing stations along Project Road. Parameters shall include N, P, oil and grease, heavy metals, C/N ratio, pH, organic matter to be monitored for three seasons per year.(as per the Environmental monitoring plan referred in the EMP) | Nr | Construction Phase | 6.0 | 6000.00 | 36,000.00 |
| 10.18 | Enhancement Measures of Cultural Properties | | | | | |
| | Paleshwar Mahadev Temple (119+600) | | | | | 19,275.00 |
| | Planting of trees and their maintenance for one year (Planting of Ornamental Trees) in 0.60 m dia holes, 1 m deep dug in the ground, mixing the soil with decayed farm yard/sludge manure, planting the saplings, backfilling the trench, watering, fixing the tree guard and maintenance tree for 1 year) | Nr | | 23.0 | 587.37 | 13,509.60 |
| | Half brick circular tree guard in 2nd class brick, internal diameter 0.9 metres, height 0.45 metres, above ground and 0.20 metre below ground. (bottom 2 courses laid dry and top three courses in cement mortar 1:6 (1 cement and 6 sand) and the intermediate courses being dry honey comb masonry) | Nr | | 23.0 | 250.63 | 5,764.59 |
| | Chikotar Mata Temple (136+050) | | | | | 74,542.00 |
| | Providing and laying interlocking paver blocks of high density 80 mm thick M-50 grade in bus-bays, truck layby and other locations as shown in the drawing, close jointed over bed of 50mm thick river sand to a tight pattern, laid to proper line and level including bedding down the completed surface with a plate vibrator or by firmly topping level with mallet and a large flat piece of timber, finishing by brushing clean dry sand over the surface to fill all the joints thoroughly and as per Additional Technical Specification A 15 or as directed by the Engineer. | SQ.M. | | 45.0 | 479.00 | 21,555.00 |
| | Supplying, fitting and fixing double leaf heavy duty iron gate (4M Wide), frame made from 50mm x 6mm M.S. flat iron with another horizontal flat at the middle, 20mm dia M.S bars at 200mm apart | Nr | | 1.0 | 7302.46 | 7,302.46 |

| Sr. No. | Description | Unit | Phase | Estimated Quantity | Unit Rate (Rs.) | Amount (Rs.) |
|---------|--|------|--------------------|--------------------|-----------------|-----------------------|
| | from bottom flat to top flat and 20 mm dia M.S. bars at 200mm apart from bottom flat to middle flat including drilling, welding etc. complete. All vertical bars are to be protruded at least 100mm above the middle and top flat is to be flattened and pointed as directed. Necessary locking arrangement on both faces, arrangement for temporary closing the gate and 2 nos.(minimum) strong iron hinges of M.S bars and flat of same sizes on each leaf to be embedded in C.C brick pillars as necessary including a red oxide painting to all iron works as directed and specified. | | | | | |
| | Compound Wall for temple up to 0.90 M height with intermediate brick pillars up to 1.5 M height at 2 M c/c with Steel Grill Work to specification above 0.9 M height. | R.M. | | 7.0 | 6526.23 | 45,683.58 |
| 10.19 | HIV/ AIDS Prevention measures | | | | | |
| | IEC materials - printing, publishing | | | 48.0 | 3000.00 | 1,44,000.00 |
| | Healthcare clinic | | | 16.0 | 30000.00 | 4,80,000.00 |
| | Condom vending machines | | | 6.0 | 15000.00 | 90,000.00 |
| | condom supplies | Nr | | 48.0 | 5000.00 | 2,40,000.00 |
| | Testing | | | 800.0 | 1500.00 | 12,00,000.00 |
| | Signages and hoardings | | | 30.0 | 15000.00 | 4,50,000.00 |
| 10.20 | Tree transplantation (Transplanting young trees within 30 to 90cm girth size) | Nr | | 516.0 | 8000.00 | 41,28,000.00 |
| 10.21 | Solid Waste Management (Provision of Bins at 10 location) | Nr | | 10.0 | 20000.00 | 2,00,000.00 |
| 10.22 | Facilitating agency remuneration for implementing the green initiation (training, awareness campaign, monitoring etc.). Continues input is required for the first two years after construction period. Thereafter only intermediate inputs are required for monitoring purpose at a frequency of once in 4 years | LS | | 5.0 | 1200000.00 | 60,00,000.00 |
| 10.23 | Vertical creeper plantation (landscaping) for the green highway stretch (Including seedling and their maintenance (watering) during project construction) | Nr | Construction Phase | 4000.0 | 800.00 | 32,00,000.00 |
| 10.24 | Landscaping maintenance cost (Including watering the creepers twice a month (for 15 years) and replacing the non-surviving creepers) | LS | Operation Phase | 15.0 | 60000.00 | 9,00,000.00 |
| | Total Implementation of Environmental Management Action Plan to be executed under Civil Works Contract carried to Grand Summary | | | | | 1,87,45,817.00 |
| | Grand Total INR. (Environmental Budget Exclusive of Cost of Measures Included Under Good Engineering Practices, with 3% contingency) | | | | | 1,93,08,192.00 |