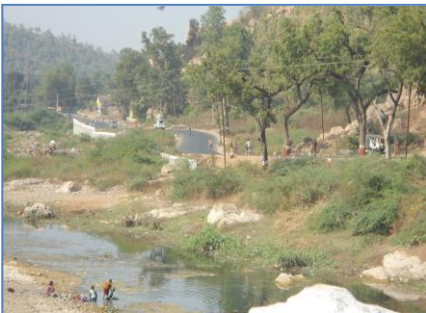


**ROADS AND BUILDINGS DEPARTMENT  
GOVERNMENT OF GUJARAT**



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

**Environmental Assessment Summary**

**March 2013**



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# 1 PROJECT BACKGROUND

1. The Government of Gujarat (GoG), through the Roads and Buildings Department (R&BD), has taken up the Gujarat State Highway Project (GSHP-II) for the second consecutive time, thus carrying out up-gradation, maintenance and improvement of core road networks that have been identified in the state. The GoG has proposed to take up this project with financial assistance from the World Bank. An Updated Strategic Options Study (USOS) has been carried out by the R&BD in 2005-06 which was subsequently revalidated in 2010 for the State Core Road network. Based on the findings of the revalidated USOS, the R&BD has prioritized 1577 km of state roads for upgradation and maintenance. The improvements of 1577 km in the project includes: (i) upgradation corridors for a length of 983 km, involving the strengthening and upgrading of single/intermediate lane roads to standard 2 lane/ 2 lane with paved shoulders / 4 lanes, and (ii) major maintenance, for the remaining 594km. In line with the prioritization exercise, R&BD-GoG has selected nine corridors (**Figure 1-1**), as projects, that shall be taken up for implementation in the first year of the project. Details of the selected corridors are given in **Table 1.1**.

**Table 1.1: List of GSHP-II Corridors**

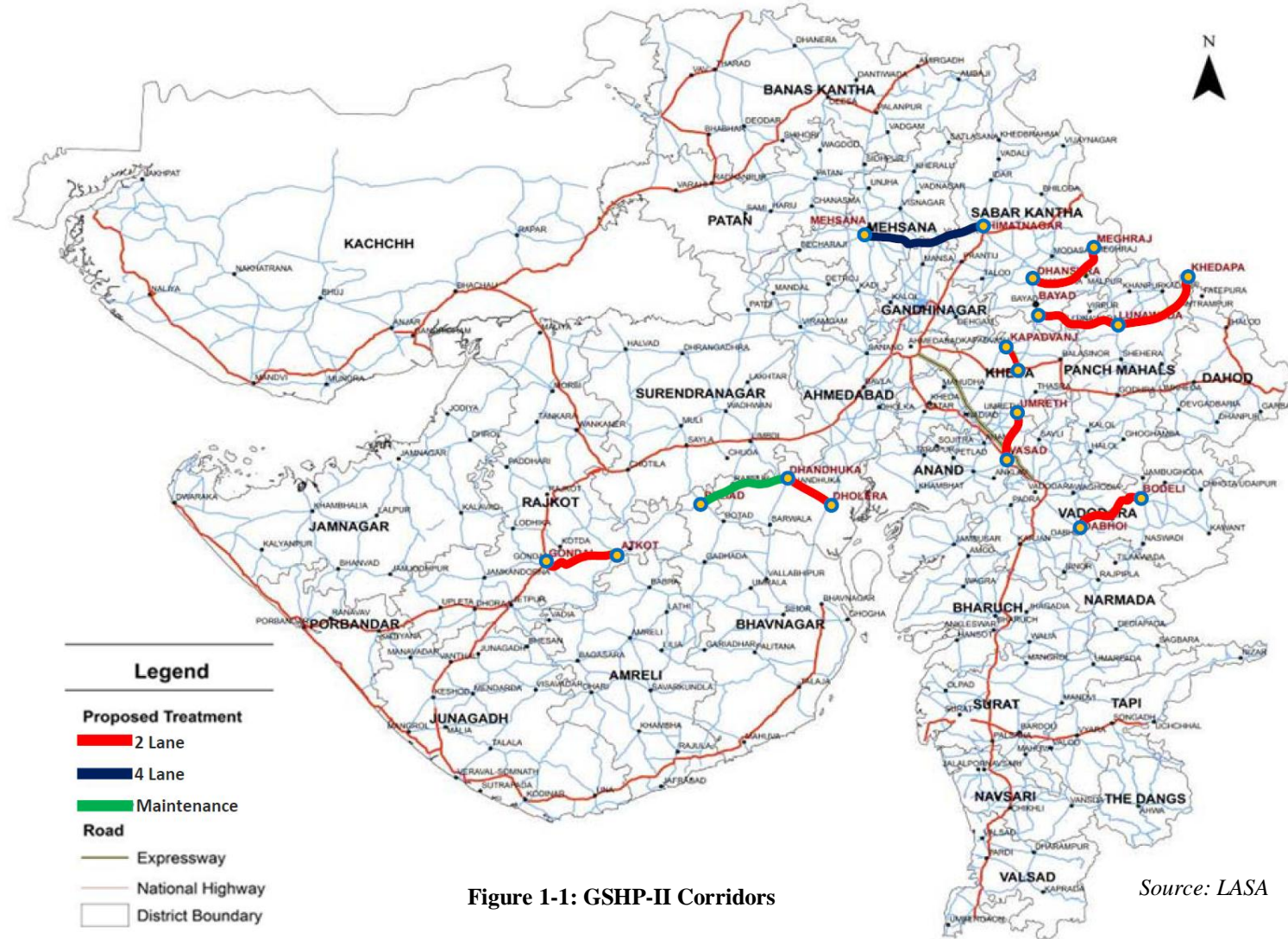
Sl. No	Link Name	Length (km)	Present Configuration	Improvement Options
<b>Up-gradation Corridors</b>				
1.	Dabhoi – Bodeli	38.60	2L	2L+PS+HS
2.	Dhandhuka - Dholera	27.00	IL	2L+HS
3.	Atkot – Gondal	35.40	NTL	2L+HS
4.	Mehsana-Himatnagar	66.15	2L/2L+PS	4L+HS+Drain
5.	Umreth- Vasad (including Kapadvanj-Ladvel)	35.45	2L	2L+PS+HS & 4L+FP+CD
6.	Bayad – Lunawada	44.56	IL, SL/2L	2L+HS
7.	Dhansura – Meghraj	46.65	SL, IL	2L+HS
8.	Lunawada – Khedapa	56.70	2L/SL	2L+HS
<b>Maintenance Corridor</b>				
9.	Paliyad-Dhanduka	46.10	NTL/2L	MN

**SL – single lane, 2L – two lane, IL – intermediate lane, NTL – narrow two lane, 4L – four lane, PS – paved shoulders, HS – hard shoulders, FP+CD – footpath with closed drain**

Source: R&BD

2. This summary report presents the Consolidated Environmental Impact Assessment (EIA) of the 8 upgradation corridors<sup>1</sup> proposed to be taken up in the first year of implementation of GSHP-II. In line with the requirements for Category “A” projects, an independent review of the Environmental Assessments has been carried out by M/S.Voyants Solutions Ltd. The findings and observations of the Independent Review on the draft environmental assessment reports have been addressed and incorporated.

<sup>1</sup> The environmental impacts of the Dhandhuka – Paliyad maintenance corridor are being addressed by providing the Environmental and Social Management Framework (ESMF) for GSHP-II.



## 1.1 Design Interventions for Upgradation Corridors

3. Based on the traffic projections till the year 2042, upgradation and rehabilitation proposals have been suggested for the GSHP-II corridors. Rural cross sections shall be implemented for major portion of the road lengths. The settlements along these corridors, urban sections shall be provided to cater to the local traffic and parking requirements. The proposed road cross sections are designed keeping in view of the following (i) to minimise additional land acquisition and forest land diversion, (ii) to minimise the felling of avenue trees for the proposed widening, (iii) for the provision of economically feasible safety interventions and (iv) to minimise the environmental degradation to the surroundings. Details of proposed road cross sections are presented in **Table 1-2** and figures below.

**Table 1-2: Proposed Cross Sections for GSHP-II Corridors**

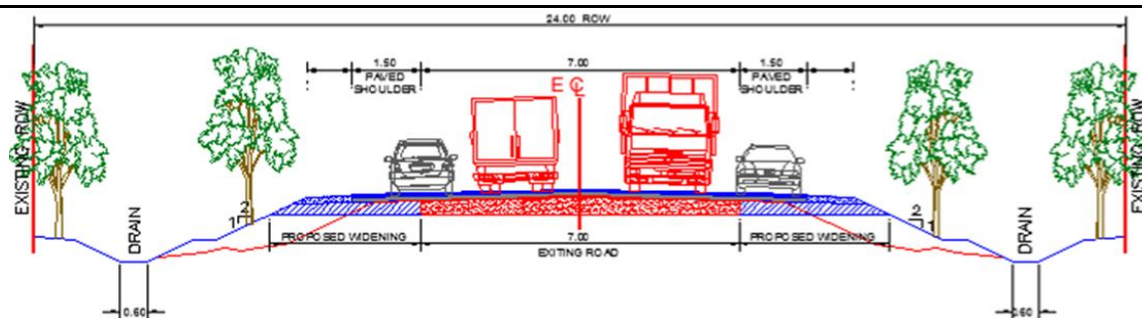
Sl. No	Link Name	Length (km)	Present Configuration	Specific Improvement Options		Reference figures
				Rural stretch	Urban stretch	
<b>Up-gradation Corridors</b>						
1	Dabhoi – Bodeli	38.60	2L	2L+PS+HS	2L+PS+HS	Figure 1-4
2	Dhandhuka - Dholera	27.00	IL	2L+HS	2L+HS	Figure 1-2
3	Atkot – Gondal	35.40	NTL	2L+HS	2L+HS	Figure 1-2
4	Mehsana-Himatnagar	66.15	2L/2L+PS	4L +HS	4L+HS+Drain	Figure 1-5
5	Umreth- Vasad (including Ladvel - Kapadvanj)	42.15	2L	2L+PS+HS	4L+FP+CD	Figure 1-3
6	Bayad – Lunawada	43.16	IL, SL/2L	2L+HS	2L+HS	Figure 1-2
7	Dhansura – Meghraj	43.05	SL, IL	2L+HS	2L+HS	Figure 1-2
8	Lunawada – Khedapa- Border	56.10	2L/SL	2L+HS	2L+HS	Figure 1-2
<b>Maintenance Corridor</b>						
9	Paliyad - Dhandhuka	46.40	NTL/2L	NTL/2L	NTL/2L	

SL – single lane, 2L – two lane, IL – intermediate lane, NTL – narrow two lane, 4L – four lane, PS – paved shoulders, HS – hard shoulders, FP+CD – footpath with closed drain

Source: LASA

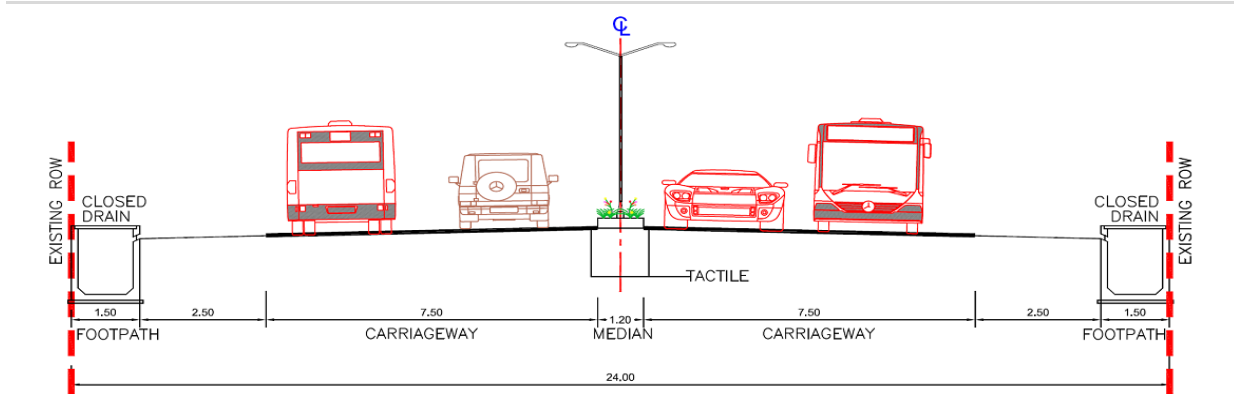
4. In addition to the improvement of road cross section by widening, strengthening and/or reconstruction of the pavement, other design measures undertaken are presented below:

- Improvement of horizontal alignment and vertical profile of the roads with minimum land acquisition and through avoidance of obstructions such as trees, utilities, road side building structures, etc. to the extent possible,
- Improvement of intersections and junctions,
- Provision of road side appurtenances such as signage, delineators, guard rails, street lighting, etc., and
- Provision of road side facilities such as road side drains, pedestrian footpaths, pedestrian and cattle crossings, bus bays, bus shelters, parking bays, etc.

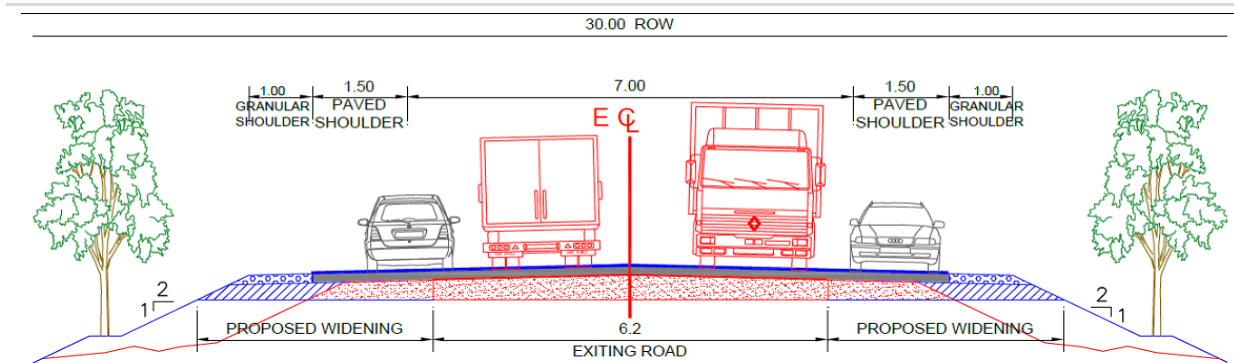


**Figure 1-2: Typical Rural Cross Section for 2 Lanes with Hard Shoulder (2L+HS) Option**

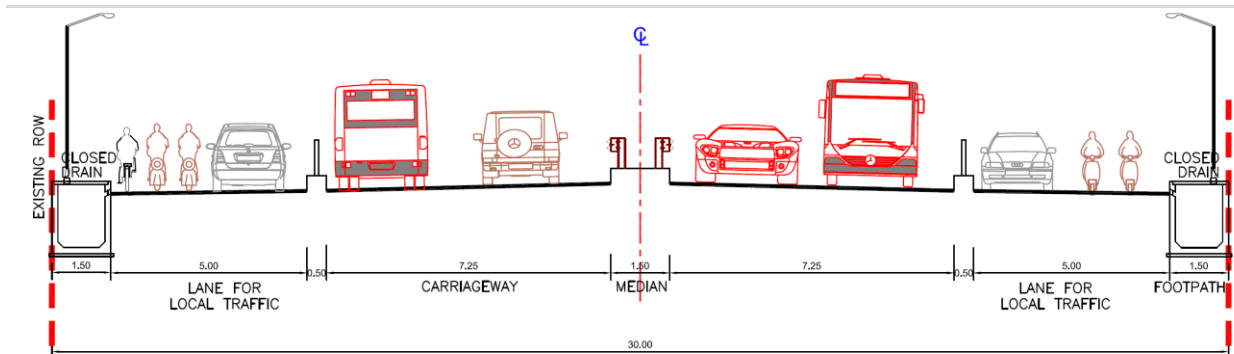




**Figure 1-3: Typical Urban Cross Section for 4 Lanes with Hard Shoulder (4L+HS) with Foot Path and Closed Drain Option**



**Figure 1-4: Typical Cross Section for 2 Lanes with Paved and Hard Shoulder (2L+PS+HS) Option**



**Figure 1-5: Typical Urban Cross Section for 4 Lanes with Hard Shoulder (4L+HS) with Drain Option**

## 1.2 Design interventions for Maintenance Corridor

5. Dhandhuka – Paliyad is the maintenance corridor among the GSHP-II corridors. The maintenance activity focuses primarily on thin resurfacing, shape correction, shoulder repairs and drainage, with some potential for inclusion of modest structural overlay. No land acquisition or widening is involved.

# 2 ENVIRONMENTAL ASSESSMENTS IN THE PROJECT

## 2.1 Objectives of Environmental Assessment

- (i) To provide a clear assessment of potential environmental impacts associated with project interventions, which forms basis for decision making;

- (ii) To integrate environmental concerns in project designs, through adoption of (i) design alternatives towards impact avoidance and prevention, (ii) feasible mitigation / management measures towards mitigation of unavoidable impacts, and, (iii) enhancement measures towards enhancing project benefits to communities;
- (iii) To significantly contribute to the overall project efforts to construct “Complete Highways”, which will be “better than before”, through adoption of measures that shall focus on “Do Good” beyond the conventional approach of “Do no harm” to environment and integrate into project designs;
- (iv) To determine the regulatory requirements to be complied for the project, and support to the GoG towards compliance of the requirements;
- (v) To enhance environmental performance of the project designs through an assessment of alternatives in terms selection of site, technology, design, performance etc;
- (vi) To integrate concerns and needs of stakeholders on environmental attributes and impacts through a continuous process of stakeholder consultations; and,
- (vii) To evolve the principles for implementation of environmental management in the project, including the implementation arrangements, supervision and monitoring for effective implementation.

## 2.2 Environmental Screening

6. The findings from the environmental screening conducted for the entire 1577km of project corridor, including the DPR corridors at an early stage of the project preparation forms the base for framing the scope and conducting the environmental impact assessment in the project corridors. The key outcome of the screening exercise are:

- (i) ‘**Environmental clearance**’ from the Expert Appraisal Committee (EAC), MoEF and State level Environmental Impact Assessment Authority (SEIAA), GoG is not required<sup>2</sup> for GSHP II corridors,
- (ii) **Forest clearances:** As per the Gujarat Government Gazette dated 5<sup>th</sup> July, 1973 and 16<sup>th</sup> August 1973<sup>3</sup>, all the proposed GSHP-II corridors (except (i) Vasad – Sarsa section in Umreth – Vasad corridor, (ii) MDR section (starts at Damod Village to Untadi) in Bayad – Lunawada corridor, (iii) Santrampur to Khedapa section in Lunawada – Khedapa corridor and (iv) Dhandhuka – Dholera corridor) are notified as protected forests. In addition, two corridors (Bayad-Lunawada and Lunawada-Khedapa) are notified as protected forests. In addition, two corridors (Bayad-Lunawada and Lunawada-Khedapa) pass through stretches of Reserved Forests (RF). Hence widening and strengthening activity mandates forest clearance for the stretches having land diversion of forest land for non-forest purposes.
- (iii) The following corridors are having significant avenue tree plantations and green tunnel stretches: Dabhoi–Bodeli, Umreth–Vasad, Mehsana-Himatnagar and Bayad-Lunawada

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<sup>2</sup> As per amendment vide S.O. 695 (E), dated 4<sup>th</sup> April 2011 to EIA Notification 14th September 2006.

<sup>3</sup> As per the Gujarat Government Gazette dated 5th July 1973, some of the State Highways (SH) and National Highways (NH) within the state of Gujarat are declared as Notified Protected Forest (NPF), under Forest (conservation) Act 1980. Hence, any infrastructure development in the identified corridors, including strengthening and widening activity would attract Forest clearance. As per the Forest act, Form ‘A’ needs to be filled by the project proponent and has to be submitted along with the necessary enclosures to the District Forest Office.

- (iv) None of the GSHP-II corridors pass through or directly impact the protected areas, and there are no corridors requiring *Wildlife Clearance*
- (v) A stretch of 3.5km (towards the Dholera end) of the Dhandhuka – Dholera corridor abuts a back water stretch subject to tidal action. This stretch falls within the master plan boundaries of the Dholera Special Investment Region (SIR) being implemented by the Dholera Special Investment Regional Development Authority, Government of Gujarat. The development of the SIR including the development of transportation networks within shall be governed by the master plan. As a result, the stretch of 3.5km within the SIR boundaries is not proposed for improvement and only maintenance of the existing carriageway is proposed.
- (vi) Cattle movement along and across the corridors were observed along Dabhoi–Bodeli, Umreth-Vasad (Kapadvanj-Ladvel) and Mehsana-Himatnagar and require safety measures to be integrated in the designs;
- (vii) Water bodies comprising of open wells, ponds and lakes have been observed along the corridors. However, impacts of the proposed road improvement on these water bodies would be negligible since they are mostly located away from the road edge.

### **2.3 Environmental Assessments – Upgradation corridors**

7. Based on the screening findings, the environmental impacts due to the proposed improvements along the upgradation corridors, with the exception of the removal of trees, shall not result in any major environmental impacts pertaining to siting of components in environmentally sensitive areas/locations. The impacts are largely construction related and can be addressed through adoption of appropriate mitigation measures during the construction period;

8. Accordingly, environmental assessments for the GSHP-II corridors have been carried out in line with the requirements of the ToR. There were no additional changes or modifications required in the original ToR necessitated due to the findings of the screening. The approach and methodology for EIA is in line with the requirements of the ToR for the assignment and the guidelines stipulated by the Ministry of Environment and Forests (MoEF), Government of India, for environmental impact assessment of highway projects.

9. Corridor specific EMP's were prepared in line with the EIA findings. The EMP includes the mitigation/management measures to address the environmental impacts and have been incorporated in the technical specifications of the bid document through modifications/amendments to the relevant MoRTH clauses for safeguarding the environment. The EMP's are provided with the necessary budget for construction and operation phase (DL period) to carry out the environmental monitoring, HIV/ AIDS prevention measures and enhancement measures for cultural and community assets.

### **2.4 Environmental Assessments – Maintenance corridors**

10. An Environmental and Social Management Framework (ESMF) has been prepared to address the limited environmental and social impacts in maintenance corridors. The provisions of the ESMF shall facilitate the PIU to comply with the requirements of the World Bank Safeguard Policies and the GoI / GoG rules and legislative requirements. This ESMF (i) describes the project interventions, (ii) provides an overview of the maintenance corridors; (iii) explains the general anticipated environmental /social impacts of the subprojects which are to be taken up under the maintenance components; (iv) specifies the methods and process to be followed by the PIU towards inventory of the environmental/social features, assessment of impacts, arrangements for meaningful consultation

with stakeholders and information disclosure requirements, followed by integration of measures into the bid documents etc; (v) provides guidance to the PIU on the various clearance requirements including obtaining clearances for corridors in eco-sensitive zones, corridors passing through notified tribal areas etc, (vi) specifies monitoring and reporting requirements; and (vii) describe the responsibilities in relation to the preparation, implementation, and progress review of safeguard documents of subprojects.

## 3 PROJECT CLEARANCES

### 3.1 Summary of Clearance Requirements

11. **Table 3-1** summarizes the clearance requirements for the project, including the agency responsible for obtaining the clearances, the time period required.

**Table 3-1: Applicable Laws and Legislations**

Sr. No.	Clearances	Acts	Approving Agency	Applicability to the Project	*Indicative Time frame	Responsibility	
						Execution	Supervision
<b>PROJECT PREPARATION STAGE</b>							
1	No Objection Certificate (NOC)	Water (Prevention and Control of Pollution) Act 1974, Air (Prevention and Control of Pollution) Act 1981	Gujarat Pollution Control Board	Applicable	3-6 months	PIU	-
2	Diversion of forest land for Non-forest use	Forest Conservation Act (1980) Forest Conservation Rules (2003) and Guidelines issued to date Government of Gujarat, Gazette dt 5 <sup>th</sup> July 1973	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	-
<b>PROJECT IMPLEMENTATION STAGE</b>							
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 contractor is extracting surface water)	3 months	Contractor	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	Contractor	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	Contractor	Engineer
7	Hot mix plant, Crushers, Cement Batching Plant	Air (Prevention and Control of Pollution) Act. 1981	Gujarat Pollution Control Board	Applicable	3 months	Contractor	Engineer
8	Storage of Hazardous Chemicals	Hazardous Waste (Management and Handling) Rules 1989 and Manufacturing Storage and	Gujarat Pollution Control Board	Applicable	3 months	Contractor	Engineer

<sup>4</sup> The right of permission vests with the Competent Authority

Sr. No.	Clearances	Acts	Approving Agency	Applicability to the Project	Indicative Time frame	Responsibility Execution Supervision
		Import of Hazardous Chemicals Rules 1989				
9	Disposal of Hazardous Waste	Hazardous Waste (Management and Handling) Rules 1989	Gujarat Pollution Control Board	Applicable	2 months	Contractor Engineer
10	Disposal of Construction Waste and liquid effluent from Labour camps	Water (Prevention and Control of Pollution) Act 1974	Gujarat Pollution Control Board	Applicable	2 months	Contractor Engineer
11	Pollution Under Control Certificate	Central Motor Vehicles Act 1988	Transport Department (GoG)	Applicable	1 Month	Contractor Engineer
12	Employing Labour	Executing Agency of Building and other construction act, 1996	Labour & Employment Department, GoG	Applicable	1 Week	Contractor Engineer
13	Registration of Workers	Labour welfare Acts.	Labour & Employment Department, GoG	Applicable	1 Month	Contractor Engineer

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

## 4 ANALYSIS OF ALTERNATIVES

12. During the entire stage of the project preparation comprising corridor identification, corridor selection, screening and detail designs preparation, various alternatives were identified and analyzed to help in decision making.

### 4.1 Prioritization of GSHP-II corridors

13. The selection of the GSHP II project roads are based on the findings of the Updated SOS study carried out by R&BD in 2010. The development of the prioritized roads over other alternative routes will result in added revenue generation from dairy, agricultural and other industrial sectors leading to enhanced economic growth. In addition, adjacent communities and road users shall benefit from proposed improvements in road safety, better environmental conditions, etc. and therefore shall contribute significantly to the growth of local economy.

### 4.2 With and Without project alternatives

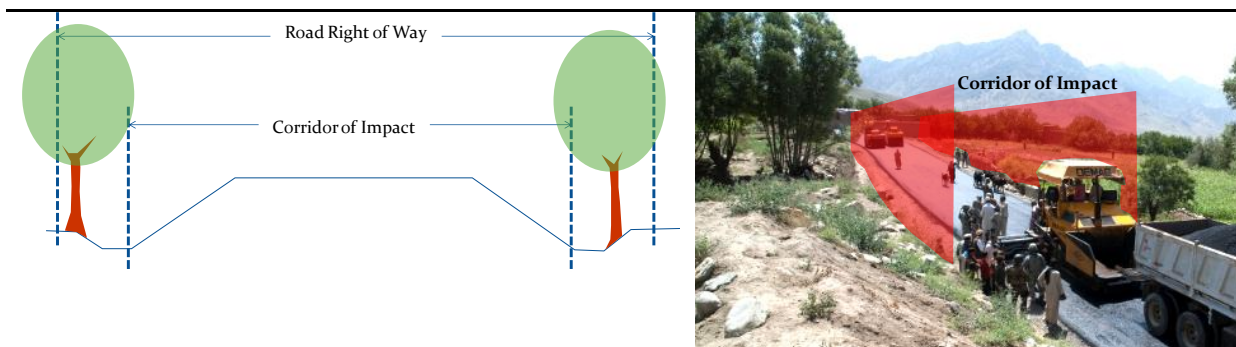
14. The “With” project scenario with positive/beneficial impacts on the traffic conditions shall vastly improve the environment resulting in betterment of social and economic development of the region. In comparison, the “Without” project scenario shall further deteriorate the present traffic conditions and adversely affect the environmental conditions and quality of life. Other factors like infrastructure development, economic analysis and other project benefits were taken into consideration for analysing with and without project scenario.

### 4.3 Highway design alternatives

15. During the project design stage the road alignment and cross section options have been identified based on applicable design standards related to traffic growth, pavement strength, design requirements, consideration of safety aspects, etc.

#### 4.3.1 Corridor of Impact approach

16. In GSHP-II, the Corridor of Impact (COI) approach has been followed to reduce impacts on environmental and social features within the Right of Way of the road. The corridor of impact considered above is the width between the toe walls of the proposed road cross section.



**Figure 4-1: Corridor of Impact and Right of Way of 2 lane roads**

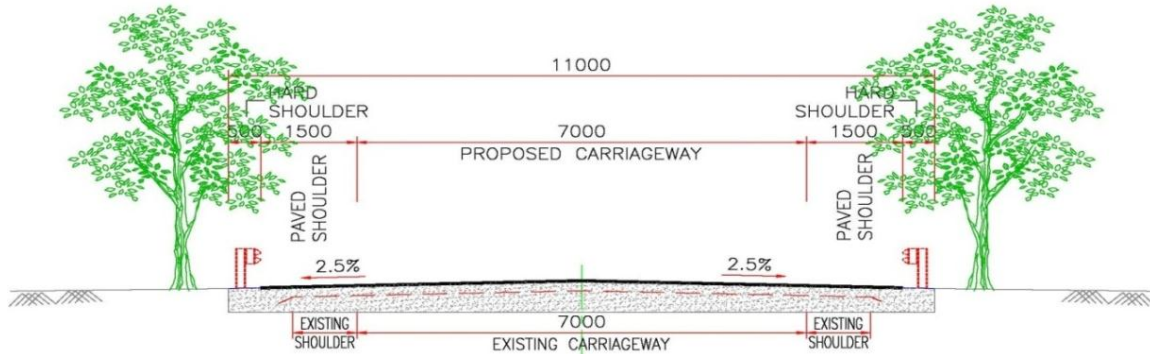
Source: LASA

#### 4.3.2 Alignment alternatives

17. Curve improvements have been minimized in the urban stretches to reduce the impact on structures and in rural areas to minimise the impact on land. In few GSHP-II corridors, such as Bayad-Lunavada corridor, efforts have been taken to bypass forest stretches through which the road presently passes, to avoid forest land diversion. At several stretches the road alignment has been slightly shifted to avoid impacts on key environmental and social features such as cultural properties and wells. Junction designs have been modified at a few locations to incorporate sensitive environmental or social feature such as cultural properties

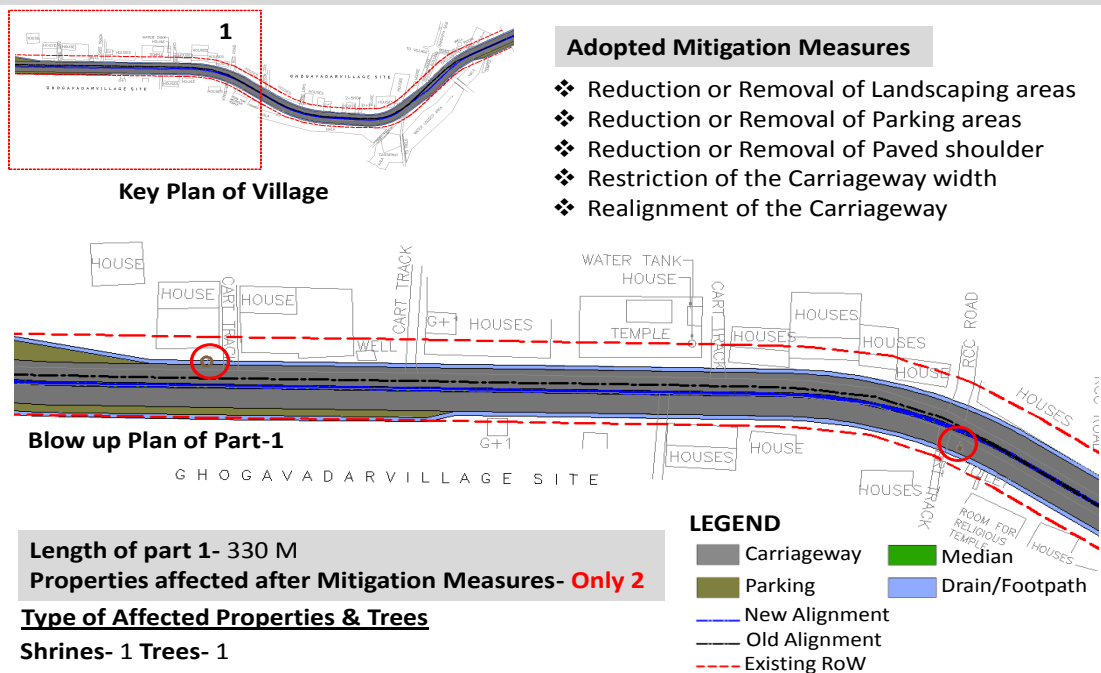
#### 4.3.3 Cross-section alternatives

- Use of retaining wall in the road embankment portion to avoid land acquisition for curve/geometric improvements
- At few stretches such as the Dabhoi-Bodeli corridor, road cross sections with minimum embankment have been adopted
- Crash barriers on outer edges of the road have been provided to ensure safety against collision with the adjacent trees
- In few corridors such as the Mehsana-Himatnagar corridor, cross sections involving tree cutting within the RoW has been preferred over acquisition of additional agricultural lands for construction of the new two lanes.
- In constricted urban stretches, additional road side parking facility has been discontinued to minimize impact on adjacent properties.



**Figure 4-2: Cross section without embankment to prevent impact on avenue trees**

**Development of Project Corridor with due consideration of Consultations and Socio Economic Survey**



**Figure 4-3: Modification of urban road cross section to minimize impacts on road side properties**

Source: LASA

#### 4.4 Protection of Water Bodies by Adopting Alternative approach

18. A total of 17 open wells are within the RoW. Several of these are in active use mainly for agricultural and domestic purposes and they are spread out as, 5 wells in Gondal – Atkot corridor, 3 wells in Bayad – Lunawada corridor and 9 wells in Dhansura – Mehraj Corridor. Shifting of alignment/ imposing box cutting are being adopted in order to avoid the impacts thus ensuring all the wells located in the corridors are protected and some of the wells are enhanced as storm water pit/ rainwater harvesting pit by connecting the storm water drains. For the purpose of ensuring safety to the road users around these wells, safety measures like guard rails, crash barriers etc. are provided.

#### **4.5 Alternative pavement construction materials**

19. Alternative green pavement construction techniques and materials have been explored and their possible use in pavement construction has been considered. Construction of Recycled Pavements and use of Warm Mix Asphalt are the two options considered as alternative pavement construction materials, details of which are presented in the section 8 Green interventions and EIA Chapter 10 Green Highways Interventions.

## **5 ENVIRONMENTAL BASELINE, IMPACTS AND MITIGATION**

20. This section assesses the nature, type and magnitude of the potential impacts during planning and design stage, construction stage and operation stage and the likely mitigation/avoidance measures on the various environmental components.

### **5.1 Meteorology**

21. The State of Gujarat has sub-humid and semi – arid climates, merging with the arid zone in the north and north-west. Large parts of the state are drought prone. In summer, the maximum temperature varies from 36°C in the coastal region to 43°C in the interior. The mean winter minimum ranges between 8°C and 10°C. Gujarat receives its rainfall from the south-west monsoon (June to September), its maximum intensity being in the months of July and August. The annual rainfall varies between 300 mm in the North and Northwest gradually increasing to 2500mm in the South. The relative humidity in all parts of the state is low. Winds are generally light to moderate, intensity increases during the late summer and monsoon seasons.

22. The microclimatic condition surrounding the GSHP-II corridors are expected to be modified due to felling of roadside trees and shall result in loss of shade and a marginal increase in temperature along the roads. Avoidance measure like designing cross-sections in order to avoid green tunnels and restricted felling within the CoI, which would ensure that the tree those which rows towards the edge of the RoW are retained and shall continue to provide shade.

### **5.2 Physiography and Terrain**

23. GSHP-II corridors fall under four physiographic regions

- (i) ***Southern Aravallis*** occupies the northeast border area of the state and is mainly comprised of quartzite with local occurrences of granites, pegmatite's, Himatnagar sandstone, basalt and marble. In general, the quartzite, granites and basalt make excellent road material; the sandstone is suitable for sub-base and embankments. The GSHP-II corridors Lunawada – Khedapa, Bayad – Lunawada and Dhansura – Meghraj falls under this region.
- (ii) ***Kathiawad Peninsula*** comprises primarily of basalt, often on or very near the ground surface. In the north-eastern portion, the older sandstone formation has not been overlaid by the more recent Deccan Trap (basalt) lava flow. The GSHP-II corridors Gondal – Atkot, Dhandhuka – Dholera and Paliad – Dhandhuka falls under this region.



(iii) **Central Plateau** is made up of deltic plains and aeolian sands. The alluvium can generally be used for embankment construction; however, many of these soils are susceptible to erosion. This can usually be controlled with suitable vegetative cover and protected channels to direct runoff to the drainage system. The GSHP-II corridors Umreth- Vasad (including Kapadvanj-Ladvel) and Mehsana -Himatnagar fall under this region.

(iv) **Deccan Plateau**, which occupies the south-eastern border area, is comprised primarily of basalt, an excellent building road material

24. Topography along the GSHP-II corridors are generally flat plains except for 2 corridors, Lunawada – Khedapa and Bayad – Lunawada corridors wherein few stretches pass through undulating terrain. The design's has not suggested any substantial changes in the height of the embankments that shall result in significant impacts on topography of the area. Rising of the embankments are proposed in flood prone areas and along the bridges. These interventions shall not alter the topography of the project area, and shall result in positive impacts.

### **5.3 Geology**

25. Geologically, the State may be divided into three broad groups, viz (i) Alluvial Deposits occupying Northern and Central region of the state and (ii) Deccan Trap Formation occupying Saurashtra region (iii) Rann Deposit residing in Kutch area and other major formations covers North west region and middle part of the Rann Formation. Majority of the GSHP-II corridors come under Alluvial Deposits followed by Jhagadia formation and Deccan Trap.

26. While no impacts on geology are anticipated along the corridor due to the construction activities, impacts are envisaged as a result of the extraction of construction materials required for the project (earth, sand, aggregates etc.). The aggregates shall be procured only from licensed quarries operating with the required environmental clearances, procurement of earth from borrow areas shall be in accordance with the MoRTH specifications and the guidelines proposed for borrow areas. At the construction sites along the corridor, blasting is prohibited. As a result, the impacts on general geology of the project area are insignificant.

### **5.4 Soils**

#### **5.4.1 Loss of productive lands**

27. Soil characteristics along GSHP-II corridors can be grouped into two, viz. Medium Black (Central Gujarat) and Grey Brown Deltaic Coastal Alluvial Soils (North and North West Gujarat). Agriculture is the predominant land use along the GSHP-II corridor, followed by barren land and settlements. Impact on agriculture land is marginal due to the available RoW. However, at the curve/geometric improvement locations, land acquisition is envisaged.

28. Efforts have been made to minimize acquisition of productive lands by reducing the CoI and modifying the cross sections. The borrow areas, construction camp locations, traffic detours and other construction sites shall not be located on productive agricultural lands. The topsoil from all areas that requires to be permanently covered shall be stripped to a specified depth of 150mm and stored in stockpiles. The stored topsoil will be utilized for the redevelopment of borrow areas, as top dressing for the road embankments and to fill slopes.

#### **5.4.2 Soil Erosion**

29. Clearance of the roadside ground cover, especially along the raised sections exposes the soil and thus destabilizes the slopes. To address the problem of soil erosion along bridge-end fills, over steep banks and embankment slopes, flatter slopes have been worked out to ensure stability and to reduce possibilities of slope failures. To check soil erosion on critical stretches, turfing on critical road embankment slopes with grass sods, in accordance with IRC: 56-1974 shall be taken up. Dry stone pitching for apron and revetment will be provided for bridges and cross drainage structures. Accurate grading of drains, correction of batter slopes to reduce erosion, provision of runoff control structures shall be in place before the start of earthworks.

30. No soil erosion is envisaged during the operation stage as all the slopes and embankments of the project road would have been stabilized through sound engineering techniques

#### **5.4.3 Compaction of Soil**

31. To prevent any compaction of soil in the adjoining productive lands beyond the CoI within the RoW, the movement of construction vehicles, machinery and equipment will be restricted to CoI. Haul roads for the transport of borrow materials and traffic detours during construction will not be routed through agricultural lands.

#### **5.4.4 Soil quality and contamination of soil**

32. The results of the soil quality monitored at nine locations along the corridors revealed the absence of pollutants or leachates at any of the sampling locations.

33. The contractor shall initiate measures to minimise waste generation from all construction activities. At the construction sites, the vehicles and equipments will be maintained and refueled only at fueling areas, without spillages. At the wash down and refuelling areas, "oil interceptors" shall be provided. Unusable debris material shall be dumped in secure landfill sites

### **5.5 Borrow Areas and Quarry Sites**

#### **5.5.1 Quarries**

34. The contractor will identify suitable licensed quarries from which materials shall be procured with the approval of the Engineer. The Engineer shall ensure that the selected quarries have approval as stipulated by the Mines and Minerals (Development and Regulation) Act, 1957. No new quarry and/or crusher units shall be located within 1000m from the residential/ settlement locations, forest boundary, wildlife movement path, breeding and nesting habitats and national parks/sanctuaries.

#### **5.5.2 Borrow Areas**

35. Borrowing is to be carried out only from designated borrow areas, road side tanks etc, with prior approval of the engineer. Borrowing is to be carried out in accordance to the guidelines laid out in IRC-10-1961, to avoid any adverse impacts. No borrow area shall be opened without the permission of the Engineer.

36. The topsoil from such borrow areas shall be conserved. To minimise impacts as spillage during the cartage of borrow materials, the access roads shall be properly maintained and the vehicles carrying borrow materials shall be covered. The contractor shall evolve site-specific redevelopment plans for each borrow area location and implement them after the approval of the Engineer.

## **5.6 Water Environment**

### **5.6.1 Surface Water Resources**

37. A total of 32 ponds, 2 lakes, 10 canal crossings and a backwater body are identified along the GSHP-II corridors. Though not a protected area or wetland, Vadhvana reservoir about 750m from the Dabhoi–Bodeli corridor at km 41+000.

38. Primary data collected from the GSHP-II corridors reveals that Electrical Conductivity (EC) values are high at Gondal – Atkot (3960  $\mu\text{s}/\text{cm}$ ), Dhandhuka-Paliyad (10230 $\mu\text{s}/\text{cm}$ ) and Dhandhuka-Dholera (11430 $\mu\text{s}/\text{cm}$ ). The increase in EC is attributed to the presence of the charged particles, this in turn increases the Chloride (Cl-) concentration, and the same is evident in these three locations and the recorded values are 679.25mg/l, 1958.9mg/l and 2766.2mg/l respectively. The Lead and Sulphate concentration exceeds the IS:10500 drinking water standards of 0.1 mg/l and 150 mg/l in Gondal – Atkot, Dhandhuka-Paliyad and Dhandhuka-Dholera. Based on the above results, the surface water quality in the three GSHP-II corridors are found to be unfit for domestic and construction purposes. The usage of water for construction purposes shall be carried out after assessing its suitability since the test results indicates high TDS and salinity values.

39. For other corridors, except for some parameters like cadmium, lead and suspended solids the other parameters of surface water quality were observed to be well within the limits. However, prior water treatment is mandatory prior to its use for domestic and construction purposes.

40. Through adoption of CoI approach, direct impacts on the existing water bodies in all the corridors have been avoided with the exception of a pond, which is located in the Mehsana – Himtanagar corridors. The impact on the water body is mostly limited to the cutting of the embankments. The loss in storage capacity, if any, to this pond shall be compensated after carrying out consultation with the local communities either by deepening or increasing the surface area of the pond.

### **5.6.2 Ground Water Resources**

41. Out of nine GSHP-II corridors, five corridors (Dhansura – Meghraj, Lunawada – Khedapa , Bayad – Lunawada, Umreth- Vasad and Dabhoi – Bodeli) falls under Archaean and two corridors (Gondal – Atkot and Paliad – Dhandhuka) falls under Deccan trap. The yield of wells in these formations ranges between 5-10m<sup>3</sup>/hr. It is observed from the groundwater feasibility map prepared by Gujarat Water Resource Development Corporation (GWRDC) that except Mehsana block, all other project areas are suitable for having either tube well or open well.

42. Primary data collected for the GSHP-II corridors reveals that the Electrical Conductivity (EC) values are high at Gondal – Atkot (1986  $\mu\text{s}/\text{cm}$ ), Dhandhuka-Paliyad (9245  $\mu\text{s}/\text{cm}$ ) and Dhandhuka-Dholera (3371  $\mu\text{s}/\text{cm}$ ). The recorded Chloride (Cl) concentration also remains high (246.1 mg/l, 1703.0mg/l and 452.83 mg/l respectively) for the three corridors, The presence of Lead, Boron and Copper concentration exceeds the IS:10500 drinking water standards for all GSHP-II corridors. Based on the above observations, certain groundwater quality parameters are found to exceed the drinking water standards. In view of health and safety, it is recommended that the contractor shall arrange for prior water treatment, before distribution of water for domestic /consumption purposes.

### **5.6.3 Water Quality**

43. Degradation of water quality is possible due to increased sediment load from construction sites and accidental discharges into watercourses from drainage of workers' camps and from spillage in vehicle parking and/or fuel and lubricant storage areas. All wastes arising from the project shall be disposed, as per GPCB norms, so as not to block the flow of water in the channels. The wastes shall be collected, stored and taken to the approved disposal sites. To avoid contamination of the various surface water bodies and drainage channels in the vicinity of the construction site, periphery of the stockpile material shall be closed with silt fencing to avoid discharge of sediment-laden runoff into water bodies. The contractor shall ensure that no sanitary wastes from the labour camps are discharged into the nearby watercourses and that oil interceptors are used at vehicle maintenance/fuelling locations.

## **5.7 Alteration of Drainage along Water Crossings**

44. As part of up-gradation works, the existing major and minor bridges are proposed to upgrade as per design requirement. Constructions along the watercourses are to be carried out in the lean flow periods. As the rivers are seasonal, the construction activities shall not necessitate any major diversion of the waterways.

45. Detailed hydrological investigations have been undertaken and suitable design of bridges and culverts have been proposed to ensure that the project road does not obstruct the existing course of the surface water flow and alter the hydrological setting. Existing cross-drainage structures shall be upgraded and additional cross-drainage structures shall be provided at locations, where the flow is obstructed at present. Recharging pits for roadside drains in urban areas are also to be provided. These vertical drains shall dispose unwanted run-off and encourage recharging of underground water resources.

## **5.8 Run-off and Drainage**

46. Increase in surface run off is attributed mainly due to the addition of hard paved shoulders, which essentially increases the paved impervious surface preventing the flow of water into the ground. Impacts due to surface runoff includes increased soil erosion as well as results in local flooding or water logging. However, as the roads have been designed with drains to take care of the runoff. The surface runoff shall be drained to the nearest cross drainage structures. The engineering design includes design of adequate cross drainage structures, which shall take care of the extra flow.

## **5.9 Water Requirements for Construction**

47. The estimated water requirement of 195 KLD shall be sourced from the tube wells or open wells for all GSHP-II corridors, except for Dhandhuka–Dholera and Mehsana – Himatnagar. As per the Gujarat Water Resources Development Corporation (GWRDC), the Dhandhuka- Dholera corridor falls in saline area. Due to its high saline concentration, the available water is unfit for construction and other purposes. Mehsana – Himatnagar corridor falls under the dark zone. Hence, exploring water in those areas shall have severe negative impact on water resources.

48. The contractor shall source the requirement of water preferably from surface water bodies, rivers, canals and tanks in the project areas. Only at locations where surface water sources are not available, the contractor can contemplate the extraction of ground water. Consent from the Engineer

that no surface water resource is available in the immediate area for the project is a pre-requisite for extraction of ground water. The contractor shall need to comply with the requirements of the state Ground Water Department for extracting ground water for construction. The contractor shall not be allowed to extract any ground water from over exploited, dark blocks and grey blocks.

### **5.10 Ambient Air Quality**

49. Ambient air quality study has been performed for all GSHP-II corridors. The selection of monitoring locations is based on the monitoring network detailed in the screening report, i.e. based on the sensitivity as well as based on the consultations. Based on the AAQ monitoring, it can be concluded that, except PM<sub>10</sub> and PM<sub>2.5</sub> all other parameters are well within the NAAQ standards prescribed by CPCB. High concentrations of Particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) are recorded at Mehsana-Himatnagar (Mehsana Town-outskirts (Ch.97+800) and Himatnagar), Dhansura-Meghraj (Malpur Junction (67+100)) and Umreth-Vasad (Umreth Junction (0+000)) corridors. The increase in particulate matter is due to the presence of high traffic movement and commercial activities along the corridors. The construction activities shall further increase the existing concentration of PM<sub>10</sub> and PM<sub>2.5</sub> and hence specific dust suppression measures are required along the construction sites/ camps.

#### **5.10.1 Generation of Dust and Exhaust Gases**

50. High levels of SO<sub>2</sub>, HC and NO<sub>x</sub> are likely from hot mix plant operations. The asphalt plants, crushers and the batching plants shall be sited at least 1000m in the downwind direction from the nearest human settlement. Vehicles delivering loose and fine materials like sand and fine aggregates shall be covered to reduce spills on existing roads. Water shall be sprayed on earthworks, temporary haulage and detour roads on a regular basis. During and after compaction of the sub-grade, water shall be sprayed at regular intervals to prevent dust generation. The hot mix plants shall be fitted with dust extraction units and cyclones/scrubbers to reduce exhaust gases. It shall be ensured that the dust emissions from the crusher and vibrating screen from the stone quarries do not exceed the standards. To ensure the efficacy of the mitigation measures suggested for reduction of gaseous emissions, air quality monitoring shall be carried out at least once every season during the period for which the hot mix plant is in operation.

51. Dust generation shall be minimal during the operation stage due to the presence of paved shoulders. All slopes and embankments as per best engineering practices shall help to minimize the dust generation during operation of the road.

### **5.11 Noise Levels**

52. Continuous 24 hours monitoring of noise levels was carried out at all GSHP-II corridors to establish the baseline noise levels along the sensitive receptors and at representative land uses along the corridors. From the observation, the noise levels recorded at the locations of sensitive receptors along the corridor indicate exceedance of the permissible standards w.r.t day and night noise levels, triggering the need for planning and implementation of appropriate mitigation measures.

53. Noise impacts during the construction stage shall be associated with heavy vehicle movements and use of mechanical equipments for earthworks, pavement laying, and bridge construction. All construction equipments used for an 8 hour shift shall conform to a standard of less

than 90dB(A). Machinery producing high noise, as concrete mixers, generators etc, shall be provided with noise shields and their usage timings shall be regulated.

54. Workers in the vicinity of high noise levels shall wear earplugs, helmets and be engaged in diversified activities to prevent prolonged exposure to noise levels of more than 90dB(A) per 8-hour shift. Construction camps, hot mix/aggregate crushing plants shall not be located within 1000 m from settlement areas, sensitive land uses as schools and hospitals. Critical locations that are likely to be adversely affected as a result of the implementation of the project have been identified. At such locations, provisions have been made in the environmental budget for noise mitigation measures.

## **5.12 Areas of Ecological Significance**

### **5.12.1 Protected and Reserve Forests**

55. All the proposed GSHP-II corridors (except (i) Vasad – Sarsa section in Umreth – Vasad corridor, (ii) MDR section (starts at Damod Village to Untadi) in Bayad – Lunawada corridor, (iii) Santrampur to Khedapa section in Lunawada – Khedapa corridor and (iv) Dhandhuka – Dholera corridor) are notified as protected forests. In addition, two corridors (Bayad-Lunawada and Lunawada-Khedapa) pass through stretches of Reserved Forests (RF). It is estimated to divert 254.74ha of protected forest area and 25.28ha of reserved forest area for the proposed development.

56. **For Protected Forest:** (i) compensatory afforestation on twice the area of PF to be diverted on degraded forest lands, (ii) NPV for the loss of forests ascertained by the Forest department and (iii) tree felling charges for each tree to be cut shall meet the expenses and shall include the cost incurred for the maintenance of the compensatory plantations proposed.

57. **For Reserve Forest:** (i) compensatory afforestation on twice the area of RF to be diverted on non-forest lands to be identified by the R&BD with assistance from the District Revenue officials, (ii) NPV for the loss of forests ascertained by the Forest department and (iii) tree felling charges for each tree to be cut shall meet the expenses and shall include the cost incurred for the maintenance of the compensatory plantations proposed.

58. **Precautionary / preventive measures during construction:** For stretches adjacent to the Protected and Reserve Forest areas, the contractor shall ensure that construction activities shall be limited to the proposed RoW, so as to avoid any impacts on the vegetation within the forest areas. Construction camps, stockyards, concrete batching or hot mix plants shall not be located within the forest area. Procurement of any kind of construction material from within the forest area is strictly prohibited. No water resources within the forest area shall be tapped for road construction. The road through forest areas shall be declared as a silence zone. Signages curbing the speed of vehicles and horns shall be placed at the start and end location and every subsequent km along the forest length.

### **5.12.2 Avifauna**

59. The influence of the avifauna on the GSHP-II corridors is found to be limited. The presence of Nalsarovar Bird Sanctuary (25km aerial distance from Dhandhuka – Dholera corridor) is the only hotspot/ environmental sensitive area in the vicinity of GSHP-II corridors. However, the presence of the sanctuary will not influence the GSHP-II corridors due to its distance.

60. Vadhvana reservoir, which is located around 750m from Dhaboi – Bodeli corridor attracts avifauna. This has been confirmed during the screening and subsequent consultation had with the forest department. However, the sighted birds are not listed under endangered/ vulnerable species.

61. **Precautionary / preventive measures during construction:** The contractor shall confirm that all the construction machineries/ equipment are conforming to the CPCB noise standards as applicable for the construction equipment. In addition, to prevent any negative impacts, the construction activities that are likely to generate noise shall be temporarily suspended for three months from October to January in these two corridors (Dhandhuka – Dholera and Dhaboi – Bodeli) in and around 1km from the designated areas “as buffer”. The specific stretches where such precautions shall be adopted will be defined in the EMP of the GSHP-II corridors.

### 5.12.3 Fauna

62. The issues pertaining to wildlife movement were discussed while carrying out consultations at the time of conducting environmental assessment along the Dabhoi - Bodeli corridor and Bayad-Lunawada. In case of Dabhoi-Bodeli, the sighting of animals along the corridor has been very rare, and it is noted that it is not location specific. Moreover, the rare sightings have been reported only during the night time. However, site inspection along with forest officials has been conducted and the locations that are suitable for animals to cross the corridor have been identified though it is not considered as an issue of concern by the forest department and by the communities. Thus, as a mitigation measure, underpass/ box culverts/ minor bridges of 8m height have been provided at the identified locations

63. In case of Bayad-Lunawada corridor, regular sighting of Nilgai (*Boselaphus tragocamelus*) was reported. For other corridors few animals namely cats –*Felischaus*, squirrels - *Funambulus pennant*, Hare –*Lepus nigricollis*, Common mongoose –*Harpestes edwardsii* and Common rat snake –*Ptyas mucosus* are commonly seen in the project area.

64. Most of the listed animals are night dwellers; hence construction activities in day time shall not have any impact on wildlife. Provisions for signages (informatory as well as cautionary signages) along stretches through reserved forests in case of Bayad – Lunawada and the stretch close to Jhambhughoda WS along Dabhoi-Bodeli shall be provided in the design.

### 5.12.4 Avenue trees

65. The predominant tree species found along the GSHP-II corridors are mainly Babul (*Acacia nilotica*), Neem (*Azadirachta indica*), Gulmohar (*Delonix regia*), Sagwan (*Tectona grandis*), Baniyan(*Ficus benghalensis*), Peepal (*Ficus religiosa*), Sheesham (*Dalbergia sissoo*), Copperpod (*Peltophorum pterocarpum*), Eucalyptus (*Eucalyptus obliqua*), Tamarind (*Tamarindus indica*), Mango (*Mangifera indica*), Amla (*Phyllanthus emblica*), Sababool (*Acacia nilotica*), Bamboo (*Bambuso ideae*), Black plum (*Prunus cerasifera*), Adusa, Neem (*Azadirachta indica*), Bad and Adiyasar. Some of the stretches has significant road side plantation of green tunnels (Avenue Trees), with large girths of over 2 m, the length of that stretches vary from Corridor to corridor.

66. The proposed road upgradation works, necessitate felling of avenue trees and removal of vegetation. As an avoidance measure, the impacts on tree cutting have been minimized through adoption of CoI approach, which has resulted in a positive measure of saving nearly 15,000 (14,889)

trees. However, for implementing the proposed widening proposal, it is estimated that 30,646 trees<sup>5</sup>, shall have direct impact, out of which 10% comprises of fruit bearing trees. While not proposed within the RoW or in the vicinity of the GSHP-II corridors, the compensatory plantation has to be undertaken by the Forest Department for other forest lands within the state and shall result in positive impacts on the ecological resources.

67. Total avoidance of impacts on green tunnels is not possible given the significant land acquisition requirements in case of Umreth-Vasad, Mehsana – Himatnagar and Bayad – Lunawada. In case of Dabhoi –Bodeli corridor, adoption of cross-sections within the available 16m clear distance between the first rows of trees has enabled avoiding impacts on green tunnel stretches.

#### **5.12.5 Coastal area**

68. A stretch of 3.5km (towards the Dholera end) of the Dhandhuka – Dholera corridor abuts a back water stretch subject to tidal action. This stretch falls within the master plan boundaries of the Dholera Special Investment Region (SIR) being implemented by the Dholera Special Investment Regional Development Authority, Government of Gujarat. The development of the SIR including the development of transportation networks within shall be governed by the master plan. As a result, the stretch of 3.5km within the SIR boundaries is not proposed for improvement and only maintenance of the existing carriageway is proposed.

#### **5.12.6 Cattle crossing**

69. During the reconnaissance survey, focus group discussions and stakeholder consultations, one of the major issues highlighted by the communities along the Umreth-Vasad, Dabhoi-Bodeli and Mehsana-Himatnagar corridors are related to the cattle crossing. All the identified corridors are having significant traffic movement and hence, the cattle crossing in the corridors shall have an impact on safety of cattle, vehicles and can further increase the occurrence of accidents.

70. As a mitigation measure, at-grade cattle crossing locations has been identified and suitable road marking's indicating cattle crossing has been proposed along the Umreth-Vasad, Dabhoi-Bodeli and Mehsana-Himatnagar corridors in order to avoid accidents due to cattle crossing.

### **5.13 Cultural properties and community assets**

71. The proposed project intervention has direct impact over the cultural and community assets located along the GSHP-II corridors. The **Table 5-1** depicts the existing number of cultural and community assets in each corridor and also the actual impact on the cultural and community assets before adopting mitigation and after adopting mitigation measures. For fully affected properties, compensation measures as suggested in the Entitlement Matrix shall be provided. For partially affected structure enhancement measure shall be provided. The cost for enhancement measures forms part of the EMP.

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<sup>5</sup> Estimated by Forest Department, GoG



**Table 5-1: Cultural and Community Assets in GSHP-II Corridor**

Sl.no	Corridor	Existing Cultural properties and community assets	Cultural properties and community assets under Impact	Cultural properties and community assets under Impact after adopting mitigation measures
1.	Dabhoi – Bodeli	12	1	-
2.	Dhandhuka – Dholera	19	4	1
3.	Atkot -Gondal	32	11	6
4.	Mehsana -Himatnagar	32	5	4
5.	Umreth- Vasad (including Ladvel - Kapadvanj)	38	5	2
6.	Bayad – Lunawada	22	-	-
7.	Dhansura – Meghraj	24	7	2
8.	Lunawada – Khedapa	26	1	-
9.	Paliyad – Dhandhuka	18	-	-

Source: LASA

## 6 ENHANCEMENT MEASURES

### 6.1 Enhancement of Community and Cultural Assets

72. There are local community resources like ponds, traditional sitting areas, schools, and wells etc. apart from cultural properties, which share mutual interests with communities/users and also enhance the quality of experience of highway travelling along the corridors. The aim of these enhancement properties is to promote qualitative development and infuse greater meaning in the road environment. Its secondary objectives are:

- To beautify and enhance the experience of travelling by beautifying the cultural and community assets along the highway,
- To restrict these properties from further encroaching the RoW, and,
- To ensure integration of design measures which significantly improve the safety conditions and improvement of the community infrastructure at these locations, and thereby benefit road users and local communities.

73. The selection of enhancement forms is influenced by the location of the properties and their physical relationship with the corridor.

#### **Guiding principles for enhancements in GSHP- II**

- The selection of properties for enhancement under GSHP II shall be in line with the following criteria (i) value or significance (ii) age (iii) building type and material (iv) ownership and (v) size of the property;
- The selection of the properties for enhancement shall be done considering potential benefits to a larger section of the community, than to private properties or assets;
- The enhancements proposed to religious structures shall strictly conform to the Supreme Court order, 2009 pertaining to removal and restriction of encroachment of religious structures on public spaces;
- The properties abutting the corridor and conforming to the selection criteria for enhancement shall be taken up as candidates for enhancement; and,
- Maintenance free and durable measures shall be adopted and confirmation from the property owners on the maintenance of the created assets shall be a prerequisite for carrying out the enhancement.

### **6.1.1 Overview of Enhancement Measures**

#### **6.1.1.1 Providing and/or improving Access**

74. Generally shrines, temples and wells along highways are often isolated from the surrounding environs. Depending upon site specific situations, the project shall strive to improve access to these properties by providing walkways from the highway. Locally available materials shall be preferred as well as using different paving patterns and materials shall create interesting ground surfaces. The intention is to enrich the roadside places.

#### **6.1.1.2 Improving, defining, redefining the precincts**

75. In addition to providing access, emphasis shall be given for defining the precinct or area of immediate influence of the property. Hard landscaping measures shall be used in continuation with the access pathway to form the precinct of the structure. Particular attention shall be paid to the entry areas of these properties.

#### **6.1.1.3 Creating seating spaces and rest areas**

76. Formal or informal seating and rest areas are adopted to match the precinct of the property. The project shall explore avenues for creation of rest areas along the highway. Rest areas with landscaping shall be developed especially near temples and community areas where space and drinking water are available. Sitting benches can be provided depending upon the specific site conditions and needs.

#### **6.1.1.4 Landscaping and Buffers**

77. Trees not only enrich the visual quality of the space but it also acts as a buffer to abate pollution, to define the area and to provide shade for the sitting areas. Plantation of trees is a prime enhancement as well as mitigation measure in the project. Tree bases shall be built around existing as well as proposed shade trees to form informal seating spaces, which are evidently preferred to the formal seating spaces.

#### **6.1.1.5 Other Enhancements**

78. Minor improvements can be done such as to propose shade trees to provide informal seating spaces, which are evidently preferred to the formal ones. Plastering and whitewashing of some cultural properties, school boundary walls, provision of shades over the wells, etc. shall be considered. Pedestrian pathways with zebra crossings and information signage's shall also be considered. Other enhancements shall be project-specific depending upon the specific site location and conditions.

### **6.1.2 Properties Selected for Enhancement**

79. Using the guiding principles for enhancements the following properties given in **Table 6-1** qualify for enhancement. A typical drawing of a temple in Gondal – Atkot corridor depicting the proposed enhancement measure is shown in the **Figure 6-3**.

**Table 6-1: Properties selected for enhancements under GSHP-II**

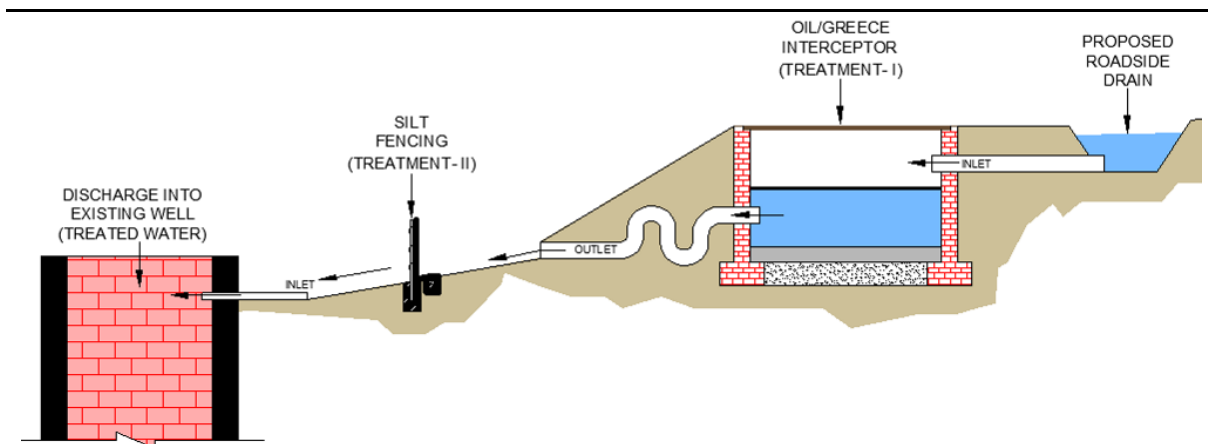
S. No.	Chainage	Name of Structure	Side	Distance from CL (m)	Age (in Years)	Size	Ownership	Building type
Corridor 1- Dabhoi-Bodeli								
1	32+800	Hanuman Temple	LHS	25	20	Large	Private	Pucca
Corridor 2- Dhandhuka-Dholera								
2	0+950	Mota Hanuman Temple	RHS	5.5	300	Large	Temple	Pucca
3	16+200	Shivji Aliyasar Temple and Pond	RHS	8	100	Large	Temple	Pucca
Corridor 3- Gondal-Atkot								
4	212+700	Shiv Temple	RHS	17	100	Large	Temple	Pucca
5	216+400	Mahadev Mandir	RHS	10.5	100	Large	Temple	Pucca
6	238+090	Public Well	LHS	7	-	Medium	Private	Pucca
7	238+180	Gayle Mata Temple	LHS	11.5	70	Large	Private	Pucca
8	245+000	Hanuman Temple	RHS	7.5	75	Medium	Government	Pucca
Corridor 4- Mehsana-Himatnagar								
9	119+600	Shiv Temple	RHS	5.5	1200	Large	Temple	Pucca
10	136+650	Chikotar Maata temple	LHS	16	100	Large	Temple	Pucca
Corridor 5- Umreth-Vasad (Including Kapadvanj-Ladvel)								
11	31+400	Shiv Temple	LHS	8	150	Large	Temple	Pucca
12	0+500	Public Well	RHS	15	100	Large	Government	Pucca
13	14+800	Graveyard	RHS	14.5	-	Large	Trust	-
14	15+100	Metholik Church	LHS	12.7	200	Large	Trust	Pucca
15	19+000	Param Guru Pathshala	LHS	11.4	70	Large	Trust	Pucca
Corridor 6- Bayad-Lunawada								
16	4+280	Shiv Temple	RHS	18	15	Large	Government	Pucca
17	9+250	Public Well	RHS	15.5	-	Large	Government	Pucca
18	11+670	Sanskar Education trust	LHS	12	-	Large	Private	Pucca
Corridor 7- Dhansura-Meghraj								
19	47+700	Vatda Primary School	LHS	7.8	-	Large	Government	Pucca
Corridor 8- Lunawada - Khedapa								
20	134+900	Chavdi Maata Temple	RHS	3	50	Large	Temple	Pucca
21	13+850	Similiya primary School	LHS	6.7	-	Large	Government	Pucca
Corridor 9- Dhandhuka – Paliyad: No Enhancement Measures								

Source: LASA

## 6.2 Rain Water Recharging Options for Open Wells

80. As an innovative method of rainwater harvesting, open wells located along the corridors of Bayad– Lunawada, Dhansura – Mehraj and Gondal – Atkot Corridor are enhanced as rainwater harvesting pits to serve the local community, such that it can meet their water requirement as well as to act as a source for groundwater recharge.

81. Two stage treatments have been proposed before letting the storm water into the open well. Major pollutants that are commonly present in the storm water runoff are oil & grease, silt and suspended particles. In the first stage of treatment, the Oil & Grease is removed through an oil and grease trap and in the second stage; the silt content is removed by introducing a silt trap. After removal of these pollutants, the storm water is allowed to flow into the open well. Typical diagram of the proposed storm water harvesting structure is shown in the **Figure-6-1**



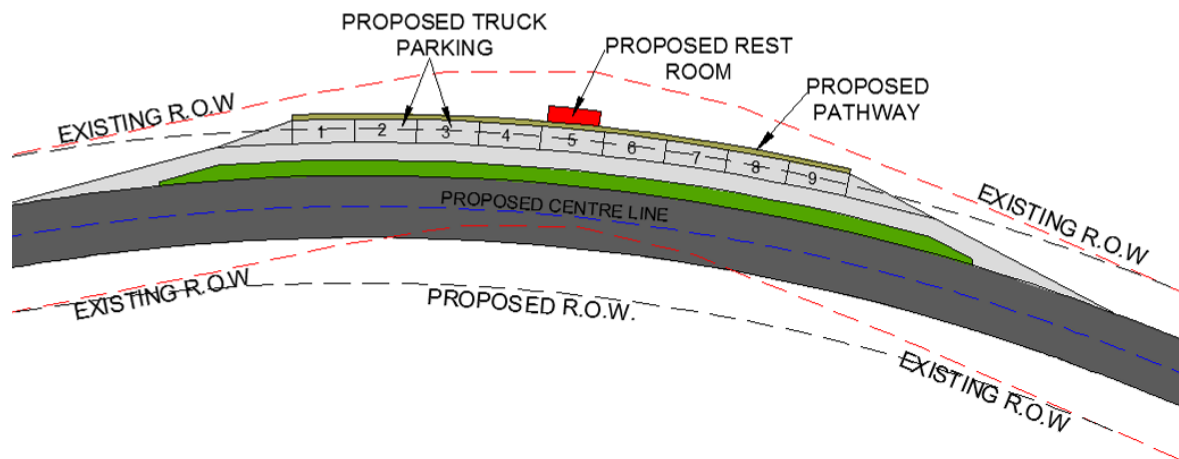
**Figure-6-1: Conceptual sketch of Storm water Management**

Source: LASA

## 6.3 Treatment of Incidental Spaces along the GSHP-II corridors

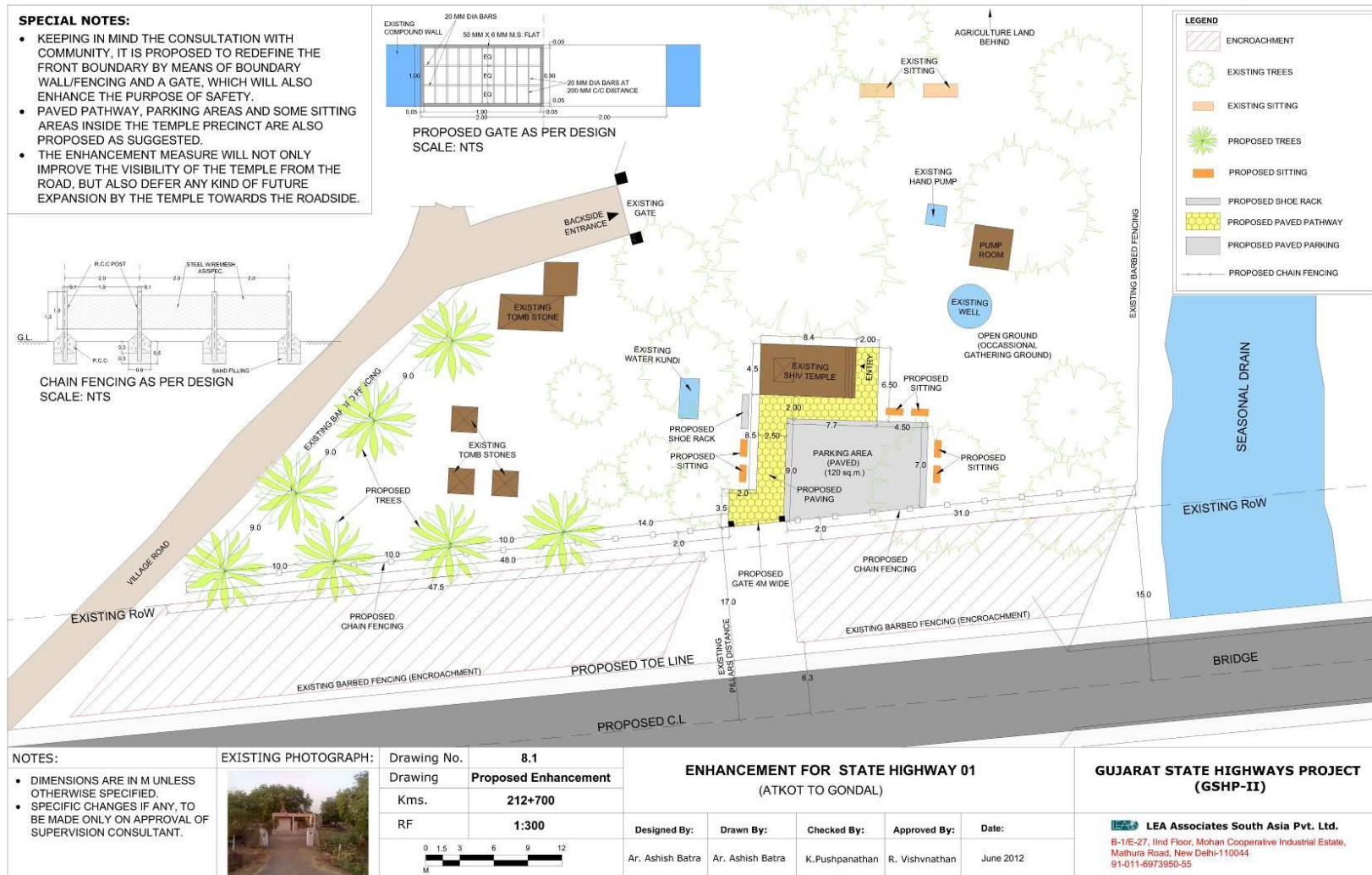
82. For the safety of vehicles and to provide adequate turning radius while driving, the horizontal transition curves are provided and it is noted that improvements can be done in the existing curves. Due to provision or improvement of these curves, sometimes incidental open spaces are generated. If unused, these spaces are rendered waste and are also vulnerable to encroachment. On the other hand, these incidental open spaces can be used for various purposes depending upon the site conditions like provision of parking areas, to enhance the aesthetic appearance of the road, tree plantation, landscaping etc.

83. Based on the design, the incidental spaces available for each corridor have been identified. For minor incidental space it is either neglected or landscaping treatment is proposed. In case of, major incidental spaces parking area has been proposed. A conceptual sketch for truck layby in Atkot-Gondal corridor is shown in **Figure 6-2**



**Figure 6-2: Conceptual Sketch of Truck Layby parking area from chainage 230+275 to 230+500**

Source: LASA



**Figure 6-3: Shiv Temple @ Ch212+700 (Atkot-Gondal)**

Source: LASA

## **7** STAKEHOLDERS CONSULTATION

84. Consultations were carried out with a wide range of stakeholders including affected communities, government agencies, municipal authorities, NGOs etc. These consultations were to disseminate information about project to the stakeholders including the potentially affected people, and also to appraise their views and suggestions about the project and the project impacts. The views expressed by the community in general and of the affected population in specific have been discussed in details with the Design Team for appropriate design interventions. At an early stage of the project, the project preparation team of the consultants identified key stakeholders for the project based on reconnaissance visits along the GSHP-II corridors.

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- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>• Potential PAPs;</li><li>• Groups of affected persons;</li><li>• Communities along the GSHP-II corridors;</li><li>• Revenue Department;</li><li>• Forest Department (FD);</li><li>• Village representatives like Sarpanch and members, PRIs, Village level health workers;</li><li>• Tribal groups;</li><li>• Local voluntary organizations like CBOs and NGOs;</li></ul> | <ul style="list-style-type: none"><li>• Women Groups and resource persons of Mission Mangalam/SakhiMandal Project;</li><li>• Field level R&amp;B Engineers;</li><li>• Gujarat State AIDS Control Society representatives;</li><li>• Tribal Development Department;</li><li>• Taluk Development Officers; and</li><li>• Other project stakeholders such as officials of line Departments.</li></ul> |
|--|--|
- 

85. The consultation mechanism had been planned at each level of project preparation. Village and Block level consultations were planned during SIA and EIA stage which shall be continued even during the project implementation. Officials of line Departments (Revenue, Town Planning and Valuation, Forest, Tribal Development and Water Resources) were consulted at State/District and Taluk level to gather relevant information.

### **7.1 Consultations with Forest Officials**

86. Consultations with the forest department officials were carried at the various field offices of the department in the project districts, as well as with the officials in Gandhinagar. Key issues discussed included:

- Forest clearances and the applicable requirements in terms of documentation, measures etc.
- Experiences w.r.t transplantation of trees in the state of Gujarat, and
- Issues if any pertaining to wildlife movement around the GSHP-II corridors.

87. The outcome of the discussion includes

#### **(i) Forest Clearance**

- Streamlining the forest clearance proposals for all GSHP-II corridors;
- Minimizing the time required for obtaining forest clearance;
- Involving forest department staffs for tree marking and preparation of necessary proposal to CCF, PCCF etc.;
- Carrying out joint inspection for the purpose of tree identification and for identifying the forest land;
- Identifying the suitable land for compensatory afforestation (CA); and,

- Preparation of an estimate for tree cutting and CA (including plantation scheme with maintenance).
- (ii) Tree Transplantation**
- Trees with less than 90cm girth are suitable for tree transplantation because of their better chance of survival. Trees with more girth size have less survival rate.
  - The forest department should identify the trees to be transplanted.
  - Tree transplantation has been done by using a hydraulic machine and hence, the presence of any utilities surrounding the tree (that are to be transplanted) should be removed/ shifted before uprooting the tree.
  - The survival rate after tree transplantation for Gulmohar trees (*Delonix regia*) is 100% and Neem trees (*Azadirachta indica*) are around 60%. Palm trees are unfit for tree transplantation (as they have never survived after tree transplantation). An intermediate space of 2m has to be provided between the trees that are being transplanted.
  - The tree transplantation shall be done only in the government land/ gocher land. Trees removed from the PF or RF shall not be transplanted in the private land. By this activity the status of the gocher land remains same and shall not be transferred as PF or RF.
  - By using the machine, it is estimated to transplant 150 trees per month and the maintenance cost including the transplantation is around 4000/-per tree
- (iii) Wildlife Movement around the GSHP-II Corridors**
- No significant proof to substantiate the wildlife movement across the GSHP-II corridors.

## **7.2 Consultation with affected Communities**

88. Community consultations have been carried out at 50 different locations along 9 GSHP-II corridors. The views, concerns and suggestions of the community were recorded. Venue, time and date of the meeting was communicated to the participants in advance. The participants included peoples' representatives, local leaders, women, STs, shop-owners, farmers, representatives from schools and religious institutions, affected people and common public.

## **7.3 Outcomes of Community Consultation**

89. Along 6 of the 8 GSHP-II corridors (except Bayad – Lunawada and Mehsana – Himatnagar), impacts pertaining to land acquisition and resettlement are minimal. The consultations along these corridors largely focused on impact on community assets, especially water sources, educational and religious structures and its relocation. Road safety issues became another major focal point of discussion. The discussions during the consultations along Bayad – Lunawada and Mehsana-Himatnagar corridors focused on the process of determination of compensation, opportunities in the project towards minimization of land acquisition etc, apart from the other community level impacts and road safety concerns. The outcomes of consultations were discussed with the design team, and all attempts were made to integrate the views and suggestions of the community into the project design (**Table 7-1**).



**Table 7-1: Key issues discussed and integration into project design**

Corridor	Highlights of Key Issues Discussed	Response/Integration into Project Design
<b>Dabhoi-Bodeli</b>	<ul style="list-style-type: none"> <li>• Compensation for affected structure to be provided at prevailing market rate;</li> <li>• Disbursement of compensation should be done within a reasonable time; advance notice should be served to relocate affected structures.</li> <li>• Road safety measures near school and hospital location and T-junction.</li> <li>• Protection of road-side trees.</li> </ul>	<ul style="list-style-type: none"> <li>• Affected structures shall be compensated as per R&amp;BD Schedule of Rates without factoring for depreciation.</li> <li>• Disbursement shall be done before the commencement of civil works; advance notice period shall be served as per RPF.</li> <li>• Provision for rumble strips, raised pedestrian crossings, warning signs, bus-bays, rotary and traffic calming measures included in design.</li> <li>• If impacts on trees become unavoidable, compensatory tree plantation shall be carried out after getting approval from Forest Department.</li> </ul>
<b>Dhandhuka-Dholera</b>	<ul style="list-style-type: none"> <li>• Considering land on LHS to avoid impact on residential and religious structures.</li> <li>• Water logging and measures to avoid the same.</li> <li>• Compensation for affected structures at market rate.</li> <li>• Movement of cattle and subsequent safety issues.</li> </ul>	<ul style="list-style-type: none"> <li>• Shift in road alignment to save the structures.</li> <li>• Provision of drains on both sides of the road included in the design.</li> <li>• Compensation at market rate following the provisions of RPF.</li> <li>• Signboards informing commuters about cattle crossing included in the design.</li> </ul>
<b>Atkot-Gondal</b>	<ul style="list-style-type: none"> <li>• Protection of religious structures, open/dug wells, to the extent possible; avoidance of impact on one school having historical importance.</li> <li>• Alternative designs to save commercial shops.</li> <li>• Movement of cattle and subsequent safety issues.</li> <li>• Developing an underpass along the present culvert location for easy movement of vehicles from villages. Presently, potential of accidents due to the direct entry of vehicles from village-road to main road.</li> <li>• Time schedule of civil works and prior notice to remove affected structures.</li> </ul>	<ul style="list-style-type: none"> <li>• Shift in alignment and limiting the impact within CoI adopted to avoid/minimize impact on structures.</li> <li>• Parking space removed or reduced to save commercial shops, to the extent possible.</li> <li>• Signboards informing commuters about cattle crossing included in the design.</li> <li>• Underpass option shall affect nearby temple of religious importance. Raised foot-path and warning signs included in design as safety measures.</li> <li>• Time schedule of civil works included in RAP and advance notice period mentioned in RPF.</li> </ul>
<b>Mehsana-Himatnagar</b>	<ul style="list-style-type: none"> <li>• Affected persons should be duly consulted before finalisation of options for rehabilitation and resettlement.</li> <li>• In addition to the compensation for loss of land and assets, GoG should give priority to affected households for jobs in government departments in accordance with the qualification of the candidate.</li> <li>• Compensation for affected land and structures should be provided at prevailing market rates.</li> <li>• Construction camps should be established away from the village area, for the purpose, barren land near the Dabhlachokdi may be considered.</li> <li>• Provision for proper drainage to drain out accumulated water on road side should be included in the design.</li> </ul>	<ul style="list-style-type: none"> <li>• Consultations will be carried out with the affected persons during project preparation as well as project implementation stages respectively.</li> <li>• Training on alternative livelihood opportunities to any one member of the household losing livelihood. Training cost upto a maximum of Rs. 15000 per person shall be borne by the project.</li> <li>• Latest Jantri value will be considered for the estimation of compensation for affected land and the compensation for affected structures will be based on R&amp;BD schedule of rates (SOR) without factoring for depreciation.</li> <li>• The site for construction camps will be identified in consultation with the village panchayat. The camp sites will be selected away from settlement areas.</li> <li>• Provision of drains on both sides of the road has been included in the design.</li> </ul>
<b>Umreth-Vasad</b>	<ul style="list-style-type: none"> <li>• Road safety measures near school locations, market places, T-junction, etc.</li> <li>• Parking space near church location.</li> <li>• Protection of water body (large pond) and open/dug well.</li> <li>• Water logging as a major problem and suggestions to provide drains.</li> </ul>	<ul style="list-style-type: none"> <li>• Road safety measures like humps, warning signs, speed-control measures, cautionary signboards, road markings included in the design.</li> <li>• Parking space included in the design.</li> <li>• Provision of retaining wall alongside the road; protection of open/dug well and provision crash barriers for safety.</li> <li>• Provision of drains on both sides of the road</li> </ul>

Corridor	Highlights of Key Issues Discussed	Response/Integration into Project Design
<b>Bayad-Lunawada</b>	<ul style="list-style-type: none"> <li>Majority of the villagers are dependent on agriculture for their livelihood and hence loss of agriculture land shall have adverse impacts on their livelihood.</li> <li>Some of the land owners are willing to part with their land; provided alternative land is made available to them as compensation for the affected land.</li> <li>People have already lost their land for the SujalamSuphalam Project, for which they had not received any compensation. Further land acquisition will add to their woes. Land acquisition should be avoided as far as possible.</li> </ul>	<p>included in the design.</p> <ul style="list-style-type: none"> <li>Loss of agriculture land will be compensated based on latest Jantri rates and assistance in the form of training for income generation will be provided following the provisions of RPF.</li> <li>Instead of land-for-land compensation, the RPF provides for , (i) registration and stamp duty charges for acquired land; and (ii) all fees, taxes and other charges as applicable under the relevant laws, apart from compensation for affected land based on latest Jantri rates.</li> <li>Sections of the corridor include widening of village roads with RoW less than 15m to two lane standards triggering land acquisition, which is unavoidable.</li> </ul>
<b>Dhansura-Meghraj</b>	<ul style="list-style-type: none"> <li>Protection of open/dug well, boundary walls and built-up structure of cultural properties.</li> <li>Safety issues, especially safety of pedestrians at T-junctions and market places; straightening of curves to avoid accidents.</li> <li>Compensation for affected structures at prevailing market rates.</li> <li>Provide compensation before the start of road construction so that the impacted shops could be relocated without affecting livelihood.</li> </ul>	<ul style="list-style-type: none"> <li>Shift in alignment and limiting the impact within CoI adopted to avoid/minimize impact on structures.</li> <li>Road safety measures like cautionary signs, road markings and speed-breakers included in the project design.</li> <li>Compensation at market rate following the provisions of RPF</li> <li>Civil works shall be initiated only after the payment of compensation, following the principles of RPF</li> </ul>
<b>Lunawada-Khedapa</b>	<ul style="list-style-type: none"> <li>Road improvements should be carried out within the available government land, avoiding land acquisition.</li> <li>Compensation for affected structures should be provided at prevailing market rates.</li> <li>Curve improvement should be carried out to avoid accidents.</li> <li>Compensation should be paid within a reasonable time period.</li> <li>Sufficient time should be given to the affected shop owners for shifting.</li> <li>The land on the RHS of the road section Lunawada-Santrampur-Zalod-Kushalgadh belongs to the erstwhile Royal family wherein there are old temples and Samadhi of the royal family. The road improvements should be carried out within the available land</li> </ul>	<ul style="list-style-type: none"> <li>The proposed improvements will be carried out within the existing RoW. For locations requiring geometric improvement, land acquisition is unavoidable.</li> <li>Compensation for affected structures will be based on R&amp;BD Schedule of Rates without factoring for depreciation.</li> <li>The curve improvements will be carried out within the available RoW.</li> <li>Compensation will be paid to the affected shop owners before the commencement of civil works.</li> <li>Notice period of 4 months will be served to the affected shop owners for shifting.</li> <li>Impacts have been minimised by limiting the proposed improvements within the RoW. Being part of Scheduled Areas, land acquisition has been completely avoided in Santrampur.</li> </ul>

Source: LASA

## 8 GREEN INTERVENTIONS

90. Vijapur – Himatnagar section (km 140+000 to km 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 to four lanes of the existing two lane facility.

### 8.1 Storm water harvesting using Dry Swales

91. Dry swales are a type of open vegetated channel used to treat and attenuate the water quality and excess volume of storm water runoff. The swale also serves as a conveyance to move excess

storm water to a downstream discharge point. The excess storm water runoff is temporarily retained in series of pools created by small check dams along the entire length of the swale. The holding time within the swale provides an opportunity for sedimentation of particulates and facilitates infiltration of runoff.

92. The proposed RoW to accommodate 4 laning in Mehsana – Himatnagar corridor has been reduced from the initial 60m to 30m due to the land acquisition and other forest related issues. The suggested dry swale (water harvesting structure) requires a minimum of 6 to 8m width of land for implementation. But, the available ROW is only 30m and the proposed 4 laning is planned within 26m CoI. Based on the discussion with the design team it is evident that the provision for the same is not feasible with the current cross section suggested for the 4 lane. Hence dry swale is *not included as green intervention* in the project design.

## **8.2 Warm Mix Asphalt**

93. A section of the Mehsana – Himatnagar corridor from Ch 129+000 to 136+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 the 2km stretch. WMA shall be used for purpose of renewal of surface during operation / maintenance phase. Based on the success of it, the WMA shall be recommended for other corridors as an alternative to HMA.

### **8.2.1 Benefits of WMA**

94. Significant advantages of WMA over HMA are as follows:

- 25 – 30% Reduction in energy consumption during the drying and heating stages of aggregate
- Significantly reduced level 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, and
- Less concern for temperature drop during transportation of the mix, leading to expansion of construction season and increase of haul distances,
- Compacting effort is less so as to achieve a specific compaction level,
- 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

95. The mentioned benefits in using the WMA shall be obtained only during the construction phase of the project. During the operation/ maintenance phase, the emission levels will depend on the vehicle speed and other road factors. The emission can be minimized only when vehicles are driven at optimum speeds.

## **8.3 Use of Fly Ash in Road Construction**

96. As per the consultation with the Gandhinagar Thermal Power Station (GTPS) officials, the availability of the fly ash for another 10 years is not possible due to high demand for its requirement from the brick kiln industries. Hence, residual ash from the ash pond had been subjected to testing for

checking its suitability to use them for the strengthening of the embankment. The test results indicates that these ash residuals do not meet the the standards for the purpose of utilizing them in the project construction. Hence it is *not recommended as a green intervention*.

#### **8.4 Use of Solar Power for Street Lighting**

97. Harvesting renewable energy is one of the key green interventions suggested in the pilot green corridor. Various options for using solar energy has been explored namely (i) Stand-alone street lights with battery backup, (ii) Grid connected system and (iii) Independent battery bank system. After careful analysis of the various advantages and disadvantages, the standalone street lights with battery backup has been preferred to be implemented between the pilot green corridor sections.

98. Three options of standalone solar PV were evaluated:

- (i) Provision of Solar Street lights at the Urban Stretches (either a standalone system or Independent battery bank system)
- (ii) Provision of Solar PV panel in the median for the entire pilot green corridor (23km from Vijapur to Himatnagar)
- (iii) Provision of Solar PV panel in the median at the selected stretches for better visibility.

99. The advantages/ disadvantages of each option were analysed and from the outcome, it has been decided to implement the second option by providing the solar PV for the entire pilot green corridor. Accordingly the specification and the budgetary provision are prepared.

100. Some of the advantages of fixing solar PV in the median are:

- Disturbance free from the avenue tree canopy
- Prevents vandalism
- Reflects a symbolic representation of green corridor to the road users/ public

101. The bid documents detailing the annuity contract for the corridor shall specify the illumination levels required along the stretches. The choice of solar lighting system shall be made by the Concessionaire, during the implementation stage. Budgetary provision for the proposed solar street light is given in the Mehasana – Himatnagar Environmental Management Plan (EMP) and the specification for the same is provided in the bid document/ contractor agreement.

#### **8.5 Tree Transplantation**

102. As part of the green corridor initiative for the road stretch between Vijapur to Himatnagar of the Mehsana-Himatnagar corridor, transplantation of smaller girth trees is proposed. In this regard prior experience of tree transplantation available with the forest department has been explored. Accordingly proposed methodology for tree transplantation on the corridor has been worked out and budget provisions have been formulated.

### **8.5.1 Tree transplantation proposal**

103. In view of the prior experience of tree transplantation in the state, it is proposed that tree transplantation shall be carried out through the tree transplanter machine. However, the following factors need due consideration while formulating the tree transplantation scheme.

- Girth size of the trees should be below 90cm and shall be determined based on the capacity of the transplanting machine,
- Trees having tap root system should be avoided unless they are very young thereby, shall have smaller tap roots,
- There should be sufficient vertical clearance with respect to overhead utilities for the entire transplanting operation,
- The donor and the recipient sites should be free of underground utilities. The cone of soil dug out by the machine is approximately 2m in depth and has 2m diameter at the ground level,
- Accessibility of the multi-axle truck carrying the transplanting equipment to the donor and recipient sites needs to be ensured.
- It is advisable to carry out the transplanting works before the monsoons so as to increase the chance of survival of the transplanted trees,
- Trees from notified forest stretches of road corridor shall be transplanted in public properties such as village grazing lands (gauchar) of the panchayat. This requires approval of the gram panchayat for receiving the roadside trees and an agreement to share half the revenue with the forest department obtained by felling these trees (at a later date).

### **8.5.2 Identification of Tree to be Transplanted in the Green Corridor**

104. Based on the tree transplantation proposal, reconnaissance survey has been conducted and the trees suitable for transplantation have been identified and recorded. It was observed that nearly 516 trees having less than 90cm girth size are proposed to be transplanted. Among these trees, species of Gulmohar (*Delonix regia*) and babul (*Acacia nilotica*) dominates the numbers followed by neem (*Azadirachta indica*) and other tree species. The trees are proposed to be transplanted in the nearby goucher land owned by the local panchayat or government.

## **8.6 Improved Waste Management Practices**

105. The key waste generators along the identified green highway stretch are due to the two settlements present in Himatnagar and Vijapur and also due to the small/medium industries located towards Vijapur. A regular collection mechanism (usually 3-4 times a week) for collecting the unsegregated wastes is prevalent in the urban areas of both the areas. Consultations indicated that road side dumping is more due to (i) the lack of bins within the settlement and the irregularity of collection, especially along the Himatnagar stretch areas and (ii) the open disposal of industrial wastes onto the RoW. In the absence of any efficient collection mechanisms, the industries dump their wastes on government lands outside the settlement limits. (Ch 141+200).

### **8.6.1 Proposed Improvements/ Management Measures for Solid Waste in the Pilot Study Area**

- Interactions with the ULBs during the detailed design to plan measures to regulate waste collection along the green corridor

- Dustbins shall be provided at the locations 139+500, 144+200, 161+100, 163+100 and 163+600.
- Awareness campaigns along the corridor to promote the corridor as a Green highway and encourage the communities/industries to adopt better waste management practices
- Agreement with the ULBs to streamline collection of wastes from the green corridor.

## 9 IMPLEMENTATION ARRANGEMENTS

106. A dedicated unit, Environmental and Social Management Unit (ESMU) has been established within the PIU towards implementation of environment and resettlement provisions in GSHP-II. The PIU, headed by the Chief Engineer shall have overall responsibility for policy guidance, coordination and planning, internal monitoring and overall reporting at the project level. During project implementation, the Contractor, Engineer and PIU shall be collectively responsible for ensuring effective implementation of the provisions of the EMP and to comply with all the statutory and legal requirements and procedures applicable to the project. The institutional responsibilities for EMP implementation are presented in **Table 9-1**.

**Table 9-1: Institutional Responsibilities**

System	Designation	Responsibilities
<b>Coordinating/Facilitating Agency</b>	Chief Engineer (WB), R&BD	<ul style="list-style-type: none"> <li>• Overview of the project implementation</li> <li>• Ensure timely budget for the EMP</li> <li>• Coordination with different state level committee, to obtain Regulatory Clearances</li> <li>• Participate in state level meetings</li> <li>• Monthly review of the progress.</li> </ul>
	Superintending Engineer PIU	<ul style="list-style-type: none"> <li>• Overall responsible for EMP implementation</li> <li>• Reporting to various stakeholders (World Bank, Regulatory bodies) on status of EMP implementation</li> <li>• Coordination with PIU Staff (Environmental officer).</li> <li>• Responsible for obtaining Regulatory Clearances</li> <li>• Review of the progress made by contractors</li> <li>• Ensure that BOQ items mentioned in EMP are executed as per Contract provisions.</li> </ul>
	Environment and R&R Specialist (PIU)	<ul style="list-style-type: none"> <li>• Assisting SE in overall implementation of EMP</li> <li>• Review of periodic reports on EMP implementation and advising SE in taking corrective measure.</li> <li>• Conducting periodic field inspection of EMP implementation</li> <li>• Assisting SE to reporting various stakeholders (World Bank, Regulatory bodies) on status of EMP implementation</li> <li>• Preparing environmental training program and conducting the same for field officers and engineers of contractor</li> </ul>
<b>Implementing/Monitoring Agency</b>	Engineer (Supervision consultant SC)	<ul style="list-style-type: none"> <li>• Responsible for supervision of effective implementation of EMP measures by the contractor</li> <li>• Review progress reports and periodic reporting to PIU about the status of EMP implementation</li> <li>• Work in close coordination with ERRS (PIU) and contractor</li> </ul>
	RAP implementation NGO	<ul style="list-style-type: none"> <li>• Conducting awareness campaign for all construction personnel (including labourers, supervisors, engineers and consultants) about HIV/AIDS/STDs in the construction and labour camps.</li> <li>• Facilitating the medical testing/ routine check-up for labours as suggested in the HPP</li> </ul>
<b>Contractor</b>	Environmental Manager of Contractor	<ul style="list-style-type: none"> <li>• Responsible for ensuring the implementation of EMP as per provision in the document.</li> </ul>

- Directly reporting to the Project Manager of the Contractor
- Discuss the various environmental/social issues and environmental/social mitigation, enhancement and monitoring actions with all concerned directly or indirectly
- Assist the project manager to ensure social and environmentally sound and safe construction practices are adopted
- Conduct periodic environmental and safety training for contractor's engineers, supervisors and workers along with sensitization on social issues that may be arise during the construction stage of the project
- Assist the PIU on various environmental monitoring and control activities including pollution monitoring; and
- Prepare and submit monthly reports to PIU on the status of implementation safeguard measures

Source: LASA

### **9.1 Integration of EMP with project**

107. To ensure the implementation of these measures by the Contractor, the entire EMP document is made a part of the contract document for the respective contract package. A detailed monitoring plan including the reporting formats and schedules for ensuring the effective implementation of the management measures are included as part of the EMP.

108. The environmental management measures have been included as specific items within the Bid document. Material quantities for implementing these measures have been worked out based on the designs and specifications. These are included in the BoQs for the project as a separate head entitled "Environmental Budget". To ensure the availability of sufficient funds for implementation of these provisions, the environmental costs have been integrated into the overall costs for the project.

109. Similar to the EMP for the upgradation roads, the Environmental and Social Management Framework for the maintenance roads will be a part of the contract document.

### **9.2 Reporting systems**

110. 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

111. Contractor and Engineer operate the reporting system for environmental condition and environmental management indicators (except tree cutting). The Environmental Management Unit 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.

112. Contractor will report to the Engineer on the progress of the implementation of environmental conditions and management measures as per the EMP. The Engineer will in turn report to the PIU on a quarterly basis.

### 9.3 Environmental Budget

113. The summary budget for the Environmental management costs for the Upgradation and Maintenance corridors to be taken up in the project are presented in **Table 9-2**.

**Table 9-2: Environmental Budget for GSHP-II Corridors**

Sl.no	GSHP-II Corridors	Environmental Budget (Including Environmental Monitoring, HIV prevention measures and Enhancement measures)in Lakhs
1.	Dabhoi – Bodeli	24,15,023.00
2.	Dhandhuka – Dholera	23,44,746.00
3.	Atkot -Gondal	33,90,156.00
4.	Mehsana–Himatnagar	1,93,08,192.00
5.	Umreth- Vasad (including Kapadvanj-Ladvel)	37,67,155.00
6.	Bayad – Lunawada	30,41,724.00
7.	Dhansura – Meghraj	23,99,913.00
8.	Lunawada – Khedapa	25,68,494.00
9.	Dhandhuka- Paliyad	4,52,685.00

Source: LASA