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NATIONAL CAPITAL REGION PLANNING BOARD PROJECT

Medium Term Strategic Evolution and Borrowers Assessment

ENVIRONMENT ASSESSMENT REPORTS ON SUB PROJECTS

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Environmental Assessment Document

A. PATAUDI WATER SUPPLY PROJECT

The Environmental Assessment is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

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I. INTRODUCTION

A. Background

1. The Project aims to promote growth and balanced development of the whole National Capital Region through providing economic base in the identified major settlements (Metro Centres/Regional Centres) for absorbing economic development impulse of Delhi, efficient transport network, development of physical infrastructure, rational land use pattern, improved environment and quality of life. In line with the objectives of the Regional Plan, the primary objective of this project are to improve quality of life and well-being of urban residents in the National Capital Region (NCR): This will be achieved by way of support to various agencies in the constituent States through NCRPB a line of credit to compliment the ongoing efforts of NCRPB in financing the regional Plan priorities and technical assistance to improve quality of planning, design and management interventions in the region. To address the twin business propositions of the National Capital Region Plannnig Board (NCRPB), – planner of relevance and a strategic financier, - the ADB line of credit comprises of both an investment loan USD 140 million and a TA component of USD 10 million. The projects to be taken up are typical of regions needs –small town water and sanitation, connectivity investments and transport infrastructure which provides multi modal transport linkages.

2. 'Augmentation of water supply for Pataudi town' as proposed by the PWD – Public Health Engineering Department (PWD – PHED), Govt. of Haryana (GoH) and submitted to the National Capital Region Planning Board (NCRPB) for financing. In this context, the sub-project has been proposed by the PWD – PHED, GoH with the objectives to:

(a) Improve infrastructural facilities and help create durable assets and quality oriented services in the identified towns.
(b) Provide potable water supply at the prescribed service level.
(c) Reduce or eliminate dependence on groundwater, and
(d) Introduce an effective water supply management system at the level of small towns.

3. This Initial Environmental Examination (IEE) assesses the environmental impacts due to the proposed water supply augmentation project. The IEE specifies measures towards addressal of the impacts. The IEE has been prepared based on a review of sub-project designs; field visits, and secondary data to characterize the environment and identify potential impacts; and consultations with stakeholders. An Environmental management plan (EMP) outlining the specific environmental measures to be adhered to during implementation of the sub-project has been prepared.

B. Compliance to ESMS of NCRPB

4. Recognizing the environmental and social issues that can arise in infrastructure projects, NCRPB has prepared a Draft Environmental and Social Management Systems (ESMS) in line with ADBs safeguard requirements for Financial Intermediaries (FIs). The ESMS provides an overall management system to NCRPB to identify, assess, and mitigate environmental and social issues that are likely to arise in projects financed by NCRPB and implemented by Implementing Agencies (IAs). The ESMS outlines the policies, methods of assessments and procedures that will enable NCRPB to ensure that a project that it funds is developed in accordance with ESMS and is adequately protected from associated risks. IAs will have to comply with the ESMS conditions while submitting their loan application. This IEE has been prepared in line with the ESMS of NCRPB.

C. Purpose of the IEE

5. The proposed components will result in positive environmental impacts. While the sub-project components have been accommodated to the extent possible within the available RoW and Government lands, land acquisition is required (of an extent of xx hectares). Given the magnitude of civil works, there would be typical construction related impacts, and could be mitigated by appropriate mitigation measures and adoption of good construction practices. Further, these will be of limited intensity and of short duration.

None of the project interventions as part of these proposed road improvements are proposed within locations in or near sensitive and valuable ecosystems, including protected areas and forests. Therefore, as per the ESMS, the sub-projects are categorized as 'B' and an IEE carried out. This IEE provides mitigation measures for impacts related to construction, operation, and maintenance.

D. Environmental Regulatory Compliance

6. The EIA Notification of the MoEF, September 2006, does not warrant environmental clearance from the MoEF for water supply projects. Further the general conditions specifying triggers[1] for Category A projects are not envisaged due to the proposed sub-project. However, the project will require consent from Competent Authorities such as the Haryana State Pollution Control Board. The ADB guidelines, stipulate addressing environmental concerns, if any, of a proposed activity in the initial stages of Project preparation. For this, the ADB Guidelines categorizes the proposed components into categories (A, B or C) to determine the level of environmental assessment[2] required to address the potential impacts. The sub-project has been categorized as B. None of the project interventions are proposed within locations in or near sensitive and valuable ecosystems, including protected areas and forests. The sub-project has been categorized as B. Accordingly this IEE is prepared to address the potential impacts. The IEE was based mainly on secondary sources of information and field reconnaissance surveys. Stakeholder consultation was an integral part of the IEE

E. Report Structure

7. This Report contains 8 sections including this introductory section: (i) introduction; (ii) description of project components; (iii) description of the environment; (iv) environmental impacts and mitigation measures; (v) institutional requirements; (vi) public consultation and information disclosure; (vii) finding and recommendation; and (viii) conclusions. An EMP outlining the specific environmental measures during implementation of the sub-project has been prepared.

1 Any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 10 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) inter-State boundaries and international boundaries.

2 Level of environmental assessment required for each category of Project, as per ADB's Environmental Assessment Guidelines 2003 is as follows: (i) Category A. Sub-project components with potential for significant adverse environmental impacts. An environmental impact assessment (EIA) is required to address significant impacts; (ii) Category B. Sub-project components judged to have some adverse environmental impacts, but of lesser degree and/or significance than those for Category A projects. An initial environmental examination (IEE) is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report. (iii) Category C. Sub-components unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are still reviewed.

II. DESCRIPTION OF PROJECT COMPONENTS

A. Project Background

8. Pataudi, a Tehsil town in Gurgaon District with current (2009) estimated population of around 22,000 (16,085 as per Census 2001). It is located on the Gurgaon – Rewari road at a distance of 25 km from Gurgaon and about 58 km from Delhi. Because of its proximity to the rapidly growing city of Gurgaon, being a part of the NCR, having good connectivity with other towns in the region, and expected growth on account of the upcoming special economic zone (SEZ), it assumes significance as an affordable option for absorbing future urban growth.

9. Besides the entire population of Pataudi, the project envisages coverage of another adjoining town of Haily Mandi and seven villages which fall en route the rising main. The total population for which the system has been designed is 1,12,380 which corresponds to year 2040 and a design period of 30 years. The system has been designed considering service levels of 135 litres/capita/day (lpcd) for the urban population and 70 lpcd for the rural population. The present water supply systems for the towns of Pataudi and Hailey Mandi are entirely based on groundwater, which in recent years have been experiencing declining yields and deteriorating water quality. As per the available records of pumping stations, the average service level in Pataudi is determined to be 59 lpcd, which is as low as 43% of the prescribed level of 135 lpcd as per the Regional Plan-2021.

10. In this context, the sub-project has been proposed by the PWD – PHED, GoH with the objectives to:

(a) Improve infrastructural facilities and help create durable assets and quality oriented services in the identified towns.
(b) Provide potable water supply at the prescribed service level.
(c) Reduce or eliminate dependence on groundwater, and
(d) Introduce an effective water supply management system at the level of small towns.

11. The new system will draw raw water from the Gurgaon Canal which is part of the Western Yamuna Canal System and carries copious flows round the year. The system is designed for gross demand of 16.3 mld at the distribution end corresponding to the intermediate year of 2025 while the intake works and transmission system are designed for the gross demand of 19.3 mld corresponding to the ultimate design year of 2040 respectively. The total project cost is estimated to be Rs. 74.06 Crore (04/2009).

B. Description of sub-project components

12. This section presents the feasibility analysis and prioritises the components for inclusion based on economic and financial analysis and integration of social and environmental safeguards.

1. Coverage

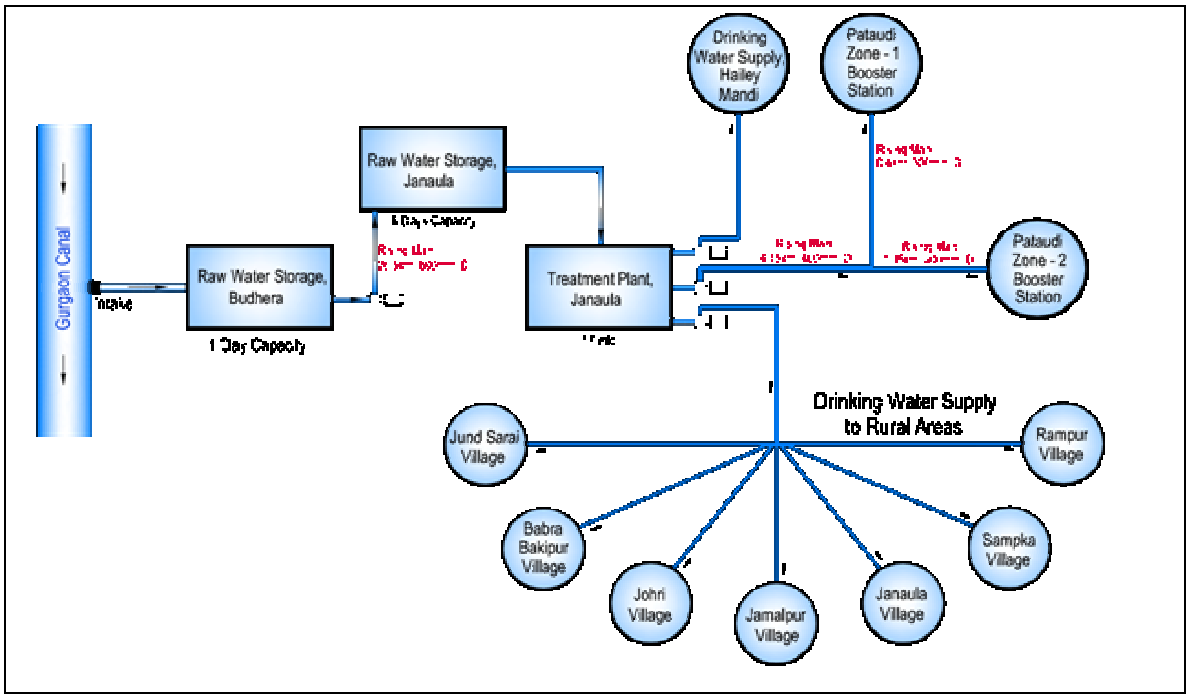
13. The sub-project will cover the entire population of Pataudi, Hailey Mandi towns and seven adjoining villages. Total population to be served in the ultimate stage of the project is of the order of 112,000.

2. Basis of process design

14. The sub-project takes 2010 as the base year and adopts a design period of 30 years which corresponds to 2040. Two phases of 15 years each are envisaged for development of the infrastructure corresponding to the demand forecast for 2025 and 2040 respectively.

15. A schematic of the overall project is presented in Figure below which comprises of raw water intake works, raw water storage for 1 day near the intake, raw water pumping station and rising main of 26km, raw water storage for 6 days at the treatment plant, a conventional treatment plant involving coagulation-flocculation, rapid sand filtration and chlorination, clear water pumping machinery and rising mains, and ground level service reservoirs and booster stations in various service zones. Raw water storage corresponding to 7 days of demand has been included considering typical annual canal closure.

FUGURE : PROPOSED WATER SUPPLY SCHEME



16. Selected critical components e.g., intake works, rising mains, clari flocculator, etc. are designed corresponding to the ultimate design period while the rest of the components, e.g., pumping machinery, storage ponds, service reservoirs, etc. which can be implemented in a modular approach have been designed for the intermediate stage of 2025.

3. Source of raw water

17. The Gurgaon Water Supply Channel (GWSC), an existing canal which is part of the Western Yamuna canal network has been identified as the raw water source for the sub-project. It is a 70 km long channel which takes off from the Delhi Branch at Kakroi in District Sonepat. It was constructed in 1993-94 as a dedicated source of supply for domestic and industrial water requirements of Gurgaon, Manesar industrial township and Bahadurgarh.

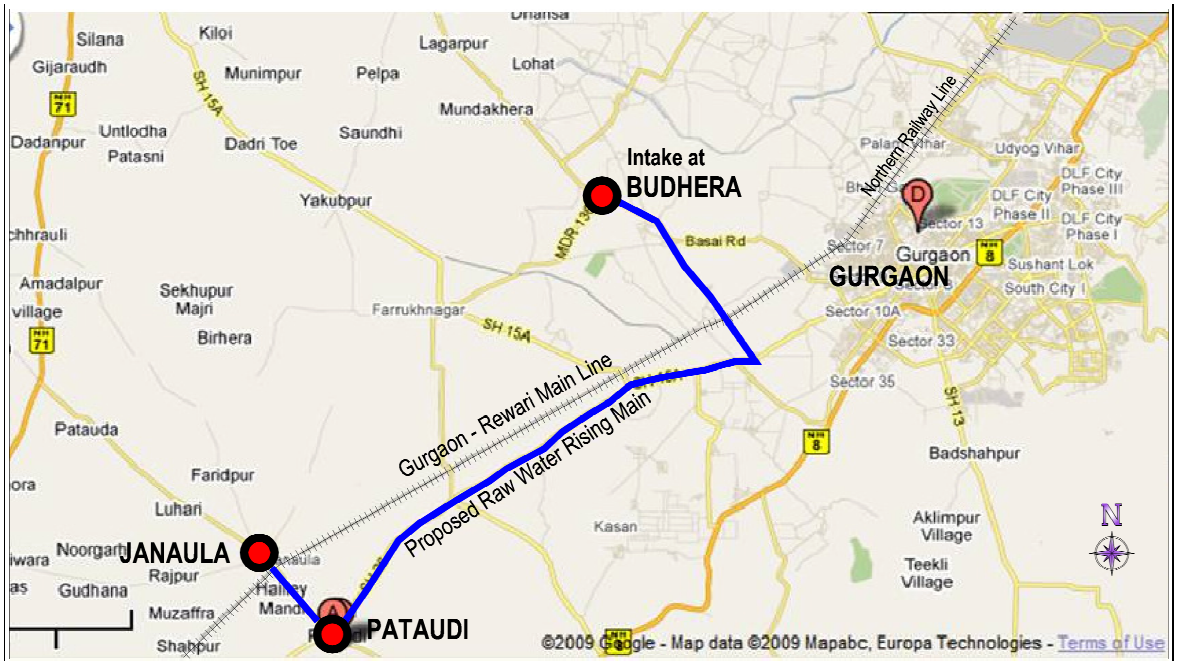
4. Intake works

18. Intake works will be located near village Budhera which is about 30 km from Pataudi and access from the Gurgaon Farukh Nagar road. The works will comprise intake pipe, road crossing, storage tank with 1 day detention capacity, suction well, raw water pumping station, staff quarters, boundary walls, internal roads etc. Provision towards the proportionate cost of construction of the Gurgaon Canal (capacity increase) to the extent of Rs. 9.3 Crore has been made under this line item. Total land area required for construction of the intake work is 5 acres. This land is proposed to be acquired and budget provision to this effect has been made.

5. Raw water transmission

19. Raw water transmission from Budhera intake works to the water works at Janaula will comprise a 26.5 km long, 600 mm diameter (pre stressed concrete) rising main. The pipeline will be laid underground and will follow the existing road alignment. The latter 3/4th part will be laid along the Gurgaon-Pataudi Road.

FIGURE **: LAYOUT PLAN OF TH RAW WATER RISING MAIN FROM BUDHERA TO JANAULA



6. Water treatment plant

20. Water works will be located near Januala on the side of the Gurgaon-Pataudi Road which is about 3 km ahead of Pataudi town. It will comprise raw water storage corresponding to 6 days of average production demand, a conventional treatment plant involving clariflocculation, rapid sand filtration and chlorination, clear water storage and pumping arrangements, etc. The backwash from the rapid sand filters is proposed to be brought back into the raw water storage tanks, thereby avoiding the problem of its disposal into surface water bodies or on land. This is a progressive approach which has been adopted by PWD-PHED in almost all its water works and which helps in conserving a substantial quantity (about 2-3%) of raw water.

7. Bulk transmission of treated water

21. The Original DPR has proposed clear water transmission to only Pataudi town. As per the design, the system comprises 4.15 km long rising main from Janaula Water Works to Zone-1 booster station at Pataudi which will be a ductile iron pipe of 400 mm dia. Another branch rising main out of the above line is 1.4 km long which will be a ductile iron pipe of 300 mm dia. Besides these two rising mains, it is recommended to include additional rising mains for Hailey Mandi town and the seven villages in the overall

scheme of the sub-project. Accordingly provision for the additional works has been made and the capital cost of the sub-project stands modified.

8. Treated water storage, service reservoirs and booster stations

22. Treated water storage will be provided at various locations. Two ground level service reservoirs (GLSR) with combined capacity of 9.7 million litres are proposed at the Janaula Water Works which corresponds to half day demand of the ultimate design year. Besides the existing booster station at Motidungri, another booster station is proposed at Shamshanghat. The existing and proposed storage capacities of GLSRs and elevated service reservoirs (ESR) at the two booster stations in Pataudi is presented in the table ** below. The capacities of GLSRs and ESRs correspond to half and one fourth the daily demand in the respective distribution zones.

23. The existing ESR at Motidungri is presently dysfunctional and it is recommended to revive it so as to help in improving service levels in zone 1, particularly during power cuts. At Hailey Mandi there are two existing underground water reservoirs of 0.5 and 0.35 million litre capacity respectively. These reservoirs and the installed pumping machinery will continue to serve the existing distribution system.

9. Water metering

24. Electromagnetic flow meters are proposed at all key locations, e.g., outlets of the raw water pumping station, and the inlets and outlets of treatment plant, booster pumping stations, etc. All these meters will have data loggers which will be able to record flows on a continuous basis. The data thus collected will be downloaded to computers on a regular basis. As a part of this component under the sub-project. From the point of view of moving towards volumetric billing and water conservation, PWD-PHED will encourage domestic and commercial consumers to install dry dial mechanical water meters of appropriate sizes. The cost is proposed to be borne by the consumers and therefore no provision on this account has been made in the sub-project capital cost.

10. Treated water distribution system

25. The distribution system has been designed for considering the demand of year 2040, a peak factor of 3 and tail end pressure of 17 m of water column. It is proposed to lay about 22 km of distribution pipelines varying from 100 to 400 mm in diameter. With regard to the material of pipes, as per the GoH orders, the sub-project proposes to use only ductile iron pipes for the distribution network.

11. Power supply

26. Power supply at the raw water intake works will be made from Makrola independent feeder which will take off from the existing Harsaru feeder. Power supply at the water treatment plant will be made from another independent feeder which will be tapped from Pataudi, involving a distance of 3 km. At both locations a substation, transformer, building, etc. will be provided. Adequate provision to this in the sub-project capital cost has been made.

C. Implementation Schedule

27. The sub-project will be implemented by the PWD-PHED over a period of 4 years from the date of release of loan. The pre-project phase includes selection of 'project management consultant' and 'design and supervision consultant', preparation of revised DPR, land acquisition, rehabilitation of project affected people, preparation of bid documents, prequalification and selection of bidders for various construction packages and preparation of 'Shifting of Utilities Plan' and procuring of 'Letter of Approval for Shifting' from concerned agencies. This phase is expected to take around 10-12 months.

28. For the implementation phase, the bar chart shows activities according to the sub-works proposed in the DPR i.e., intake works, raw water rising main, treatment plant, clear water rising mains, booster stations at various locations, installation of bulk water meters and finally laying of distribution network. Under each sub-work, activities have been split along civil, electrical and mechanical works. Key components of this phase are expected to take between 24 month for completion and commissioning of water supply to Pataudi town. The components for Hailey Mandi and the seven villages will be implemented in the following 12 months.

III. Description of the Environment

29. Helimandi and Pataudi are neighboring towns in Pataudi block, situated near the foot-hills of Aravalli hills, in the western part of Gurgaon district of North Indian State of Haryana. This area comes under the National Capital Region (NCR). Pataudi town lies at 28°19' N latitude and 76°46'60" E longitude, at an altitude 240 m (787 feet) above mean sea level (MSL) Nearest airport is at Delhi (48 km). Pataudi Road rail-head links it with Rewari, Gurgaon, New Delhi, Jaipur and other major cities. NH 8 connects this place with Gurgaon (38 km) and Delhi (70 km) by road. These two towns are located in Seismic Zone IV.

A. Physical Environment

1. Terrain

30. Pataudi block has conspicuously flat topography, though the Gurgaon district has diverse physiographic features due to plains on the one side and foot-hill extensions of Aravalli hills on another side. The Pataudi block is an alluvial plain formed by the tributary of River Yamuna, namely Sahibi River. The inland depressions cause drainage problems, leading to water logging in monsoon. The soil is heterogeneous; in some places it is rocky. Alluvial thickness varies from almost insignificant to above 203 m, in and around Pataudi, as revealed by boreholes drilled in this block.

2. Climate

31. The climate of the area is tropical, semi-arid and hot. The climate is characterized by the dryness in air, a hot summer and a cold winter. Average temperature in of the district ranges from 5.1°C in January to 40.5°C in May and June. Four seasons of the district are winter from the end of November to beginning of March, dry summer from March to June, south-west monsoon from last week of July to September and post-monsoon season in October and November. The Pataudi block receives lesser rain-fall than the eastern part of the district. Annual average rainfall in the district is 596 mm, with 28 normal rainy days in a year. Average rainfall in monsoon season is 508 mm (77% of the total rainfall). The air is generally dry during the greater part of the year. Humidity is high in the south-west monsoon season. April and May are the driest months when the relative humidity in the morning is about 30 per cent and in the afternoon less than 20%. Winds are generally light but gain force in the summer and monsoon seasons.

3. Soils

32. Major soil type in Gurgaon district is loamy sand. Tropical and brown soils exist in the north-western extreme, northern and north-eastern parts of the Gurgaon district, where the Pataudi block is situated. In Pataudi and Sohna blocks the organic content of soils is low, i.e., below 0.20%, while in the rest of the district it is 0.20% to 0.40%.

4. Geology

33. Gurgaon district is occupied by Quaternary alluvium and Pre-Cambrian meta- sediments of Delhi Super Group, represented by Alwar quartizites, mica schists and pegmatite intrusives of the Alwar series and slates of phyllites and quartzites of the subrecent alluvium and sand dunes. The alluvium comprises of thick beds of fine to coarse-grained sand with alternating layers of thin clays. The formations comprise mainly quartzites, slates, phyllites, and schists. The district is rich in kaolin and silica sand.

5. Land Use

34. Total geographical area of Gurgaon district is 1254 sq km., with cultivable land of 1230 sq km. More than 75% of the land is used for agriculture (980 sq km.). Forest cover is little (30 sq km.). Mining is also prevalent in the district. Growth induced by inclusion of the district in the National Capital Region (NCR) gets reflected by increase of land use for residential and industrial purposes.

6. Surface Waters

35. There is no perennial river in the district. Sahibi river passing through the Pataudi block of the district, and rain-fed canals, ponds, and lakes constitute surface water. Gurgaon canal has been constructed at New Okhla Barrage on Yamuna river for irrigation purposes.

7. Groundwater

36. At present Pataudi relies on groundwater for sourcing its drinking water. However, the groundwater sources for the Tehsil are overexploited – use is greater than recharge. Aquifers in parts of Gurgaon district are yielding brackish water, making it unfit for consumption. In Gurgaon there are freshwater aquifers of limited thickness which are underlain by saline water aquifers. The aquifers have limited yielding prospective. The major water bearing strata are the alluvium, sands, silt, kankar and gravel zones of the district. However some areas with weathered quartzite also have semi consolidated sand beds which have a potential for water bearing horizons.

37. Ground water in this area occurs in unconfined and semi-confined condition. The upper zone of saturation consists of fine sand with silt varying from place to place. The pre-monsoon depth of water level in the district ranges from 7.45 m bgl to 52.10 m bgl. The water level is deep in the north-eastern, central and south-eastern parts of the district. The depth of water level in Pataudi block ranges between 20 m bgl to 30 m bgl. The altitude of water table ranges between 176.78 to 274.85m above MSL. In north and western parts of the district, covering Pataudi block, the water table slopes north and north-west, whereas in southern part water table slopes toward southern direction with an average hydraulic gradient of 1.5 m/km. Net annual ground water availability of the district is 20215.12 ham and existing gross ground water draft for all users is 33055.33 ham. In Pataudi block the net annual ground water availability is 4917.64 ham, while the gross annual draft for all uses us 10899.20 ham, showing over-exploitation of 222%. The shallow ground water of the district is alkaline in nature (pH 7.25 to 8.13) and is moderate to highly saline (EC 805 to 3410µS/cm). Ground waters in many areas show high nitrate and fluoride contents, making the water unsuitable for drinking purposes. The mean fluoride concentration in drinking water samples taken at Pataudi, Haileymandi and Harsary village were 1.68±0.35, 3.22± 1.18 and 1.78± 0.12 mg/l (Standard limit – 1.5 mg/l). Similarly, ground water decline in Hailymandi and Bilaspur are 1.2 m/year and 0.77 m/year, respectively. Water parameters recorded in Hailymandi during September 2009 is shown in Table.

Site Name	TDS mg/ l	Total Hardness as CaCo3 mg/ l	Magnesium mg/ l	Chlorides mg/l	Fluorides mg/l	Alkalinity mg/l
Tadapur MLA scheme	1553	340	57.6	450	1.13	300
Todapur – 5	1094	350	60	220	1.44	290
Tatoli Booster	1990	480	86.4	650	0.48	400
Acceptable limit	550	300	30	250	1	300
Permissible limit	2000	600	100	1000	1.5	600

8. Ambient Air quality

38. Ambient air quality monitored near Pataudi block recorded SPM ranging from 95 µg/m^3 (Winter) to 223 µg/m^3 (Summer); RPM ranging from 20 µg/m^3 (Winter) to 61 µg/m^3 (Summer); SO2 ranging from 6 µg/m^3 (Winter) to 21 µg/m^3 (Summer). NOx ranging from 7 µg/m^3 (Winter) to 23 µg/m^3 (Summer). CO values were found to be below the detectable limit of 114.5 µg/m^3. (Source: Central Pollution Control Board report)

9. Ambient Noise Levels

39. The noise levels ranging from 42.1 dB(A) (Monsoon & Post Monsoon) to 52.1 dB(A) (Winter) and 36.3 dB(A) (Monsoon & Winter) to 48.6 dB(A) (Post Monsoon) during the day and night time respectively. These values are within the limits of Ambient Noise Level Standards prescribed by CPCB.

10. Ecological Resources

40. The land use is predominantly agricultural and there are no forests or protected areas in the vicinity of the Pataudi town. Sultanpur birds' sanctuary and Aravalli hills are the sensitive sites located within 50km of the townsThe trees and shrubs in the area include dhauk (Anogeissus pendula), Anogeissus pendula

(dhauk), Acacia leucophlea (ronj), Acacia Senegal (khairi), Acacia nilotica (kikar), Holoptelea integrifolia (papri), Butea monosperma (dhak), Acacia jacquemontii (bambul) and Balanites aegyptiaca (hingo), ziziphus nummularia (jharberi or pala), Ziziphus mauritiana (ber), Crateva adansonia (barna), Capparis deciduas (kair), Diospyros Montana (kaindu) and Euphorbia royleana (thor).

11. Disasters

41. According to the Vulnerability Atlas of India the NCR falls in the,

- High damage risk zone (MSK VIII) for earthquakes
- Very high damage risk zone B (Vb = 50m/s) for wind and cyclone hazards
- Areas liable to floods, which are more site specific and consist of low-lying areas and the flood plain.

42. There are a number of faults and other tectonic features that trigger earthquakes in the NCR. The major ones are, Sohna fault, Aravalli fault, Hidden Moradabad fault in the Indo-Gangetic basin, Sonepat-Delhi-Sohna fault, Junction of Aravalli and Sohna fault, and the Delhi-Haridwar ridge. Earthquakes of intensity lower than four on the Richter scale have originated from 14 epicentres located in the NCR. Two major lineaments, namely Delhi-Hardwar ridge and Delhi- Moradabad fault, pass through the NCR, both having potential of generating earthquakes of magnitude up to 6.5 to 6.7 and normal depth of 30 kms. The NCR lies in the earthquake zone IV, the second highest vulnerable zones with respect to seismic impacts. The proposed designs shall integrate the risks of seismic activities on the project components, through adoption of the standards.

B. Social and Cultural Resources

1. Demographic profile

43. Total population of Pataudi and Haileymandi towns was 16,085 and 17,081, respectively (15.93% and 16.92% of Pataudi taluk). Pataudi taluk has population of 100,957 (6.08% of undivided Gurgoan district). There is no notified scheduled tribe in the State. Demographic profile of the area is shown in the Table:-

Table-...: DEMOGRAPHIC PROFILE OF PATAUDI AND HAILEYMANDI TOWNS

		Haryana State	Gurgaon district (undivided)	Pataudi taluk	Pataudi town	Hailey-mandi town
Total population		21144564	1660289	100957	16085	17081
Urban population (%)		28.92	22.23	32.85		
Rural population (%)		71.08	77.77	67.14		
Sex-ratio	T	861	873	898		
	R	866	876	905		
	U	847	861	884	887	881
SC population (%)	T	19.35	11.32	22.32		
	R	21.36	10.97	21.25		
	U	14.39	12.54	24.52	23.27	25.69
Children below 6 years of age (%)	T	15.78	20.08	15.69		
	R	16.52	21.51	15.50		
	U	14.00	15.07	16.09	17.48	14.77
Sex-ratio of children below 6 years of age	T	819	858	799		
	R	823	866	801		
	U	808	816	794	801	787

		Haryana State	Gurgaon district (undivided)	Pataudi taluk	Pataudi town	Hailey-mandi town
Total Literacy Rate (%)	T	67.91	62.91	74.48		
	R	63.19	57.09	74.45		
	U	79.16	81.71	74.55	67.94	80.58
Female Literacy Rate (%)	T	25.91	47.79	29.41		
	R	22.99	39.79	28.89		
	U	32.85	73.77	30.48	27.06	33.60
Work Participation Rate (%)	T	39.62	37.92	37.37		
	R	42.92	39.57	40.77		
	U	31.49	32.14	30.40	27.93	32.73
Main workers to Total workers (%)	T	74.50	73.79	73.84		
	R	70.05	69.80	70.09		
	U	89.41	91.02	84.10	87.04	81.74
Sex-ratio of total workers	T	466	517	513		
	R	579	611	652		
	U	182	211	231	166	289
Workers in agriculture (%)	T	51.29	40.29	40.14		
	R	68.83	48.27	49.37		
	U	5.93	5.91	14.85	13.04	16.29

(T – Total; R – Rural; U – Urban) Source: Census of India, 2001.

2. Industries

44. Agriculture is the major occupation in the rural areas of the district. Proximity to Delhi and presence in the National Capital Region has witnessed industrial growth in the district. Mining and allied operations are prevalent in this area. Growth of tertiary sector of industry induces further growth in this area.

3. Physical Infrastructure Services

45. Establishment of drinking water supply, sewerage and sanitation facilities are governed by the Water Supply and Sanitation wing of Public Works Department. Public Health Engineering department is also involved in water supply and sewerage disposal. There is no comprehensive sewerage system in Pataudi. There are however some individual septic tanks. The waste from the septic tanks and other houses is finally disposed in the existing storm water drains of the town, which in turn flows into low lying areas on the outskirts of the town.

46. There is no primary solid waste collection system in Pataudi town with the waste storage and collection points properly identified. Also, there is no at-source waste segregation or waste transportation system. This has resulted in waste dumped both within the town and on the outskirts and could risk the contamination of the groundwater. The Municipal Council also does not have a bio-medical waste disposal system. The estimated solid waste produced in Pataudi and Hailey Mandi is 6 MT/day each.

47. Pautaudi block has a Community Health Centre with 50 beds run by the Health department of the State. Fluorosis is endemic in Pataudi and Haileymandi due to excess concentration of fluoride in drinking water of

IV. Identification of Environmental Impacts and Mitigation Measures

48. The assessment for each of the sub-projects has been carried out for potential impacts during the following stages of the project planning and implementation:

- **Location impacts.** Impacts associated with site selection, including impacts on environment and resettlement or livelihood related impacts on communities
- **Design impacts.** Impacts arising from project design, including the technology used, scale of operations, discharge standards etc
- **Construction impacts.** Impacts resulting from construction activities including site clearance, earthworks, civil works, etc.
- **O&M impacts.** Impacts associated with the operation and maintenance of the infrastructure built in the project.

A. Land acquisition and resettlement impacts

49. The project involves acquisition of private agricultural land measuring 30 acres for siting the Water Treatment Plant (WTP) and 5 acres at the intake point. Water will be drawn from the Gurgaon water Supply Canal at Budhera village where an intake station is proposed in private land measuring 5 acres. From the intake station water will be transferred through 600mm dia transmission main to Janaula village where a water treatment plant is proposed in private land measuring 30 acres. The 26.5km long transmission main will be laid along road margins and will not involve any land acquisition but will cause temporary disruption to residences and business establishment along the transmission main alignment. Both boosting stations proposed are being sited in existing Municipality land. Water from WTP to boosting station will be transferred through 400/300mm dia transmission main that will be laid along the road margins and will not involve any land acquisition. In all, the project envisages acquisition of 35 acres of private agricultural land.

50. The acquisition of 35 acres of private agricultural land will cause loss of income to the 27 landowners from whom land is proposed to be acquired. The water transmission mains are likely to cause temporary disruption to commercial establishment and residences along the alignment. Involuntary resettlement impacts are not significant and the census and socio-economic surveys in the project area have revealed that there are no IP amongst the landowners or among agricultural labourers and hence the project will not require any IPP. However, after the 4(1) notification under LA Act and preparation of land plan schedule, if any IP is identified, the project will address the same in line with the Draft ESMS of NCRPB.

51. The project will impact 27 households who would lose their cultivable land. The project does not impact any common property resources.

52. In line with the Draft ESMS of NCRPB, projects funded by NCRPB will require a resettlement plan and/or an indigenous peoples plan commensurate with the significance3 of impact. Providing Water Supply

[3] As per the Draft ESMS projects are categorized based on the significance of involuntary resettlement and impact to indigenous peoples. Involuntary resettlement categories are (a) Category S-1 (Significant Impact): means 200 or more people will experience major impacts, which are defined as (i) being physically displaced from housing, or (ii) losing 10% or more of their productive assets (income generating). Category S-1 projects require a full resettlement plan; (b) Category S-2 (Not Significant). Category S-2 projects include involuntary resettlement impacts that are not deemed significant and require a short resettlement plan; and (c) Involuntary Resettlement Category S-3: There is no involuntary resettlement impacts and hence does not require any action. Indigenous Peoples categories are (a) S-I Significant impacts are those projects that directly or indirectly affect the dignity, human rights, livelihood systems, or culture of indigenous peoples or affect the territories or natural or cultural resources that Indigenous peoples own, use, occupy or claim as their ancestral domain. Category S-1 projects will require a indigenous peoples plan; (b) S-2 Not Significant are projects where the indigenous peoples are the sole or the overwhelming majority of project beneficiaries, and when

to Pataudi Town will come under S-2 category for involuntary resettlement and S-3 category for indigenous peoples as per NCRPB's social categorization.

53. A short resettlement plan has been prepared in line with the Draft ESMS requirements. The summary of resettlement impacts is given in the following table.

Table: Summary of Resettlement Impacts

Impact	Providing Water Supply for Pataudi Town
Permanent Land Acquisition (ha)	35.0 acres
Temporary Land Acquisition (ha)	0
Affected Households (AHs)	27 [a]
Affected Persons (APs)	157
Titled APs	157
Non-titled APs (Encroachers)	0
Female-headed AH	0
IP/ST-headed AH	0
BPL AH	0
Affected Structures	0
Affected Trees/Crops	0
Affected Common Property Resources	0
Average Family Size	5.8
Average Household Income	Rs.6,333/- p.m.

[a] *The 27 households losing their cultivable land will face significant impact.*

B. Environmental Impacts

54. The potential impacts occurring from this project have been identified below.

55. Location impacts are not likely to be significant as there are no major environmentally sensitive areas along the sub-project locations. The location impacts will pertain to

- Land acquisition of 35 ha is envisaged due to the proposed project components. A total of 27 households are likely to be affected. The affected households will be adequately compensated as per the entitlement framework for the project.
- Also, during laying the network some cultural properties like temples and shrines may be impacted, such as the Shiv temple near the boosting station. This could be in the form of damage or reduced

only positive impacts are identified. Category S-2 projects will require a summary note on IP in project document; and (c) S-3 are projects where no impacts on indigenous peoples are envisaged and hence does not require any action.

access to the shrine. Similarly there will be trees along the alignment and near the structures. These may need to be removed for construction. It will be possible to identify the total number of shrines and trees that may require rehabilitation after the details of the water supply network, treatment plant and boosting stations are developed.

- Access to water from the Gurgaon Canal at Budhera to the intake station requires to cross a railway track (Delhi Rewari Rail) and the main road (Gurgaon – Farukhanagar). This can disrupt local traffic on the road and also if care is not disrupt railway traffic on the route.
- Land is required for the intake station at Budhera and the WTP at Janala. This is productive agricultural land and an appropriate Resettlement Plan will need to developed to ensure
- Laying of rising mains from WTP to Storage Reservoirs would involve cutting and filling along certain sections as the storage reservoirs are located on elevated locations.

56. Design impacts will pertain to

- Alteration of drainage pattern of the site
- Encroachment into surrounding land use
- Land Acquisition; Relocation of Public utilities; and Restoration of Access Roads

57. The construction impacts will pertain to

- The construction activities would require space for the temporary office and storage area of construction material. Construction activities are to be spread out as they will consist of activities at Budhera intake point, at the WTP at Janaula, for the 26.5 kms pipeline which comes out from Janaula and is to pass along the Gurgaon – Pataudi Road, on its way to Pataudi, Hailey Mandi and villages enroute. Therefore the storage of construction material will be scattered and in some areas along major roads, disrupting traffic and movement in towns and also access to agricultural fields along the raising main.
- This land along the rising main is agricultural lands, therefore access to the fields could be reduced and construction material and waste may impact the quality of the soil, if adequate safeguards are not implemented that reduce disruption during the agricultural season.
- There may be further disruptions during harvest and sowing periods where heavy agriculture vehicles like harvesters would move on the roads and also in the Laying pipelines will also include the busy Rewari road and the Hodal - Patauda link road. Of these the Hodal –Patauda link road is at present being widened and therefore there are already severe traffic jams. These could worsen if adequate safeguards are not implemented during the construction period of this project.
- Also, during construction access to houses, shops and various amenities in the towns may be disrupted while laying the piped network. Disturbance due to noise, dust and vibrations throughout the town can be expected during construction.
- Disposal of construction wastes, designated disposal locations for the cut material should be identified prior to initiation of construction activities and got approved by the engineer supervising the construction activities.
- Indiscriminate stockpiling and disposal of construction material may lead to land degradation requiring adherence to good construction practices. Waste management plans, indicating approximate quantities of waste to be generated and the possible disposal locations, to be prepared and implemented.
- Temporary loss to access is envisaged due to construction of road along existing cart tracts for approach onto the storage reservoirs. These issues need to be addressed and traffic diversion / management plans where necessary are to be prepared and implemented during construction stage.
- Clearance / trampling of vegetation is envisaged during laying of rising mains, construction of approach roads as well as during construction of storage reservoirs.
- Fugitive dust generation and increased day time noise levels due to construction activities in the immediate vicinity necessitating adherence to good construction practices

58. The O&M impacts will pertain to:

- There are no major concerns during the operation phase. However, at the WTP possibility of accidents due to leakage of chlorine and during its storage could impact the workers. Since the WTP at Janaula

adjoining a residential area the local population at Janauna may also suffer during an accident at the WTP.

- Disruption of traffic in the town during routine maintenance can also be expected, even through much of this will be localised in nature.
- Spillage of chemicals and other toxic chemicals used for water treatment from the treatment plants during flooding is also a potential impact that needs to be addressed
- Water leaks from storage reservoirs need to be checked regularly and adequate protection measures in case of spillage of the reservoirs need to be taken.

59. With this impacts and mitigation measures in view an EMP is worked out and provided as an independent document.

V. Environmental Management Plan

60. Potential environmental impacts identified in the IEE due to implementation of the project components are to be minimized or avoided through appropriate mitigation and avoidance measures mentioned in Table 5. The agencies that are responsible for implementing the measures that are required to be undertaken have been identified.

Table 1: Environmental Impacts and mitigation measures

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
1	**Location Impacts**				
1.1	Land acquisition impacts and conversion of fertile agricultural lands the WTP and the intake point. Land needs to be acquired both at Budhera and Janaula. However, no land needs to be acquired for the overhead tanks as they will be located on land belonging to the PWD WS &S.	Permanent	Major	Affected land owners will be compensated in accordance to the Resettlement Plan for the project prepared in line with the ESMS of NCRPB	PHED
1.5	Laying of rising mains from would involve cutting and filling	Permanent	Major	The raw water transmission main alignment is proposed along the existing The pipeline will be laid underground and will follow the existing road alignment. The latter 3/4th part will be laid along the Gurgaon-Pataudi Road. Cut and fill along the rising main alignments, storage reservoir locations and location of approach roads will be avoided to the extent feasible. Where cut and fill are necessary the quantities will be balanced subject to technical feasibility to encourage reuse of cut quantities.	PHED / DPR consultant
1.6	Location of storage reservoirs involves clearing of vegetation and trees.	Permanent	Minor	Storage area locations have degraded vegetation in most locations. However, it will be ensured that vegetation outside the designated construction site is not affected. The designs shall be worked out to have minimum impacts on trees and clearance of vegetation	PHED / DPR consultant
2	**Design and pre-construction Impacts**				
2.1	Alterations of drainage pattern of the site	Permanent	Major	Design of cross drainage structures would be carried out so as to avoid alteration of drainage pattern. Design would be done considering 50 year return flood level to avoid overtopping of the roads and maintain natural drainage	PHED / DPR consultant
2.2	Contamination of drainage channels from soil eroded	Permanent	Major	Project sections shall be designed to avoid cut and fill as far as possible. Where cutting and filling are not avoidable they shall be balanced to encourage reuse of cut material within the project construction site	PHED / DPR consultant
	Cutting of trees and vegetation clearance in the WTP, main transportation pipelines, intake point, and the primary distribution network.	Permanent	Moderate	Minimize tree-cutting to the extent feasible for the WTP and the water distribution network. Minimize it to extent possible by exploring alternative design options. While trees exist in the town, as land identified for the WTP and intake are mainly agricultural fields tree felling is mainly to access these sites along the road – Gurgaon – Farukhnagar road, road between Budhera and Jaulana. Some tree felling may exist for the construction of main transportation pipeline from Jaulana to Pataudi as it is laid along agricultural fields and the road connecting Gurgaon with Pataudi. Obtain Forest Department clearance for the cutting of trees Compensatory plantation shall be done as per State	PHED / DPR consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				Government guidelines and provisions of the ESMS of NCRPB.	
2.5	Demolition of religious structures like temple	Permanent	Severe[4]	Avoid the requirement of shifting of cultural properties due to the water supply network alignment, e.g site identified for the overhead tank at Shamshan Ghat – which is near a big Shiv temple. The alignments of the raising mains and other networks, including access roads shall avoid impact on religious structures to the extent feasible. In case the structures could not be avoided, they shall be reconstructed at a location mutually agreed with the local people.	PHED / DPR consultant
2.6	Land Acquisition; Relocation of Public utilities; and Restoration of Access Roads	Permanent	Severe	All community assets such as water storage tanks, community structures, land acquisition involved and the restoration of access roads in regular use by public that are to be affected shall be relocated with prior approval of the concerned local authority as per the R&R policy.	PHED / DPR consultant
3	**Pre-construction Activities by Contractor**				
3.1	Construction Camps – Location, Selection, Design and Layout	Temporary	Moderate	The construction camps will be located at least 500m away from habitations at identified sites. Locate in barren / waste lands and not fertile agricultural land All fuel oil / lubricants loading and unloading areas shall be paved; and have separate storm water collection system fore separation of oil / lubricants prior to discharge. Provide adequate water supply, sanitation, septic tanks, soak pits of adequate capacity. Restore the site to its original state after use. Proper training of labourers and management of waste, if any Prepare a waste management plan for the camps, including an appropriate sanitation and drainage system	Contractor / Supervision Consultant
3.2	Drinking water availability and water arrangement	Temporary	Severe	The contractor shall be responsible for arrangement of water in every workplace at suitable and easily accessible place for the whole construction period. Sufficient supply of cold potable water (as per IS: 10500) to be provided and maintained. If the drinking water is obtained from an intermittent public water supply then, storage tanks will be provided.	Contractor / Supervision Consultant
3.3	Identification of disposal sites	Permanent	Major	Location of disposal sites shall be finalized only after the Engineer shall certify that these are not located within designated environmentally sensitive zones and confirm that: • Disposal of the material does not impact natural drainage courses • No endangered / rare flora is impacted by such material • Not in the vicinity of settlements and sensitive landuses.	Contractor / Supervision Consultant
3.4	Quarry Operations	Permanent	Major	It has to be ensured that materials are obtained from licensed quarries having environmental clearance. Quality and legality to be examined by the Contractor and copies of environmental clearances for these needs to be submitted prior to sourcing of material.	Contractor / Supervision Consultant
4	**Construction Impacts**				
4.2	Improper stockpiling of construction materials can cause impacts starting from	Temporary	Moderate	Due consideration shall be given for material storage and construction sites such that it doesn't cause any hindrance to daily traffic movement. Stockpiles shall be covered to protect	Contractor / Supervision Consultant

[4] Though this is considered a severe impact, reconstruction of religious structures demolished would offset the severity of impacts.

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
	obstruction of drainage, disturbance/ safety hazard to local population, traffic blockage, and lead to land degradation			from dust and erosion. Waste management plans, indicating approximate quantities of waste to be generated and the possible disposal locations, to be prepared and implemented.	
4.4	Quarry / Borrow pits Operations	Permanent	Moderate	Adequate safety precautions shall be ensured during transportation of quarry material from quarries to the construction site. Vehicles transporting the material shall be covered to prevent spillage. Operations to be undertaken by the contractor as per the direction and satisfaction of the Engineer.	Contractor / Supervision Consultant
4.5	Stripping, stocking and preservation of top soil	Permanent	Moderate	The topsoil from borrow areas, areas of cutting and areas to be permanently covered will be stripped to a specified depth of 150mm and stored in stockpiles. The stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and the height of the pile is to be restricted to 2m. Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur. The stockpiles will be covered with gunny bags or tarpaulin. It will be ensured by the contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles. Such stockpiled topsoil will be returned to cover the disturbed area and cut slopes.	Contractor / Supervision Consultant
4.6	Disposal of cut material is a potential impact as the storage reservoirs are located in the eco-sensitive zones.	Temporary	Moderate	Designated disposal locations for the cut material should be identified prior to initiation of construction activities and got approved by the engineer supervising the construction activities	Contractor / Supervision Consultant
4.7	Soil Erosion	Permanent	Moderate	Slope protection measures shall be undertaken along slopes where cutting is involved adopting suitable slope protection techniques. The suitability to be decided by the Engineer at site. The work shall consist of measures as per design, or as directed by the Engineer to control soil erosion, sedimentation and water pollution. All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earthwork or other items of work.	Contractor / Supervision Consultant
4.8	Compaction of Soil	Temporary	Minor	To minimize soil compaction construction vehicle, machinery and equipment will move or be stationed in the construction site as designated by the Engineer only. The haul roads for construction materials should be routed to avoid agricultural areas	Contractor / Supervision Consultant
4.9	Blasting	Permanent	Moderate	Except as may be provided in the contract or ordered or authorized by the Engineer, the Contractor will not use explosives. Where the use of explosives is so provided or ordered or authorized, the Contractor will comply with the requirements of the following besides the law of the land as applicable. The Contractor will at all times take every possible precaution and will comply with appropriate laws and regulations relating to the importation, handling, transportation, storage and use of explosives and will, at all times when engaged in blasting operations, post sufficient warning flagmen, to the full satisfaction of the Engineer. The Contractor will at all times make full liaison with and inform well in advance and obtain such permission as is required from all Government Authorities, public bodies and	Contractor / Supervision Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				private parties whomsoever concerned or affected or likely to be concerned or affected by blasting operations. Blasting will be carried out only with permission of the Engineer. All the statutory laws, regulations, rules etc., pertaining to acquisition, transport, storage, handling and use of explosives will be strictly followed.	
4.11	Loss of Public / Community Water Sources	Permanent	Minor	All water sources potable or else used by the public/community e.g. water tanks along the streams if lost due to the proposed civil works in the construction of transmission mains or distribution networks shall be replaced immediately. The relocation of these shall be decided in consultation with the local people.	Contractor / Supervision Consultant
4.12	Temporary loss to access is envisaged due to construction of road along existing cart tracts for approach onto the storage reservoirs.	Temporary	Moderate	The contractor shall provide safe and convenient passage for vehicles, pedestrians and livestock to and from side roads and property access connecting the project road. Construction activities that shall affect the use of side roads and existing access to individual properties shall not be undertaken without providing adequate access. The construction works will not interfere with the convenience of the public or the access to, use and occupation of public or private roads, or any other access to properties, whether public or private.	Contractor / Supervision Consultant
	In laying the primary network, shops may lose income if customers' access is impeded	Temporary	Moderate	Provide bridges to allow people & vehicles to cross trench Inform shopkeepers of work in advance Since this area is dependent on agriculture, there is heavy traffic during the sowing and harvesting periods – for the kharif and rabi season. This period needs to be avoided for construction on the main roads – the Rewari Road and the Hodal – Patada link road in the town.	Contractor / Supervision Consultant
	Proposed laying of the primary network might require relocation of utility lines.	Temporary	Moderate	Ensure that all utilities lost due to the project will be relocated with the prior approval of the concerned agencies. Provide alternative water to affected residents.	Contractor / Supervision Consultant
4.13	Soil and Water Pollution due to fuel, lubricants and construction waste	Temporary	Moderate	The fuel storage and vehicle cleaning area shall be stationed at least 300m away from the nearest drain/water body. Oil interceptor shall be provided at construction vehicle parking area, vehicle repair area and workshops ensuring that all wastewater flows into the interceptor prior to its discharge.	Contractor / Supervision Consultant
4.16	Generation of Dust	Temporary	Minor	The contractor shall take every precaution to reduce the levels of dust at construction sites to the satisfaction of the Engineer. All earthwork to be protected/covered in a manner acceptable to the satisfaction of the engineer to minimise dust generation. Clearance shall be affected immediately by manual sweeping and removal of debris, or if so directed by the Engineer, the construction site shall be hosed or watered using necessary equipment.	Contractor / Supervision Consultant
4.18	Emission from Construction Vehicles, Equipment and Machinery	Temporary	Moderate	The discharge standards promulgated under the Environmental Protection Act, 1986 shall be strictly adhered to. All vehicles, equipment and machinery used for construction shall conform to the relevant Bureau of Indian Standard (BIS) norms. All vehicles, equipments and machinery used for construction shall be regularly maintained to ensure that pollution emission levels comply with the relevant requirements of SPCB and the Engineer. 'PUC' certificates shall be obtained regularly for all vehicles used for the project. Copies shall be submitted	Contractor / Supervision Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				regularly to the Engineer.	
4.20	Noise from construction Equipments	Temporary	Moderate	Maintenance of vehicles, equipment and machinery shall be regular and to the satisfaction of the Engineer, to keep noise from these at a minimum. All vehicles and equipment used for construction will be fitted with exhaust silencers. During routine servicing operations, the effectiveness of exhaust silencers will be checked and if found to be defective will be replaced. Notwithstanding any other conditions of contract, noise level from any item of plant(s) must comply with the relevant legislation for levels of noise emission.	Contractor / Supervision Consultant
4.21	Traffic Control and Safety	Temporary	Moderate	The contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, marking flags, lights and flagmen as per Engineer's direction and satisfaction, for the information and protection of traffic approaching or passing through the section under improvement. Before taking up any construction, detailed Traffic Control Plans shall be prepared and submitted to the Engineer for approval, 5 days prior to commencement of work on any section of road. The traffic control plans shall contain details of arrangements for construction under traffic and details of traffic arrangement after cessation of work each day.	Contractor / Supervision Consultant
4.23	Material Handling at Site	Temporary	Minor	All workers employed on mixing asphaltic material, cement, lime mortars, concrete etc., will be provided with protective footwear and protective goggles. Workers, who are engaged in welding works, would be provided with welder's protective eye-shields. Workers engaged in stone breaking activities will be provided with protective goggles and clothing and will be seated at sufficiently safe intervals. The use of any toxic chemical will be strictly in accordance with the manufacturer's instructions. The Engineer will be given at least 6 working days notice of the proposed use of any chemical. A register of all toxic chemicals delivered to the site will be kept and maintained up to date by the Contractor. The register will include the trade name, physical properties and characteristics, chemical ingredients, health and safety hazard information, safe handling and storage procedures, and emergency and first aid procedures for the product.	Contractor / Supervision Consultant
4.25	Safety Measures During Construction	Temporary	Moderate	All relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996 will be adhered to. Adequate safety measures for workers during handling of materials at site will be taken up. The contractor has to comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress. The Personal Protective Equipment for workers on the project shall conform to respective IS codes.	Contractor / Supervision Consultant
4.26	Risk caused by Force Majure	Temporary	Minor	All reasonable precaution will be taken to prevent danger of the workers and the public from fire, flood, drowning, etc. All necessary steps will be taken for prompt first aid treatment of all injuries likely to be sustained during the course of work.	Contractor / Supervision Consultant
4.27	Malaria Risk	Temporary	Minor	The Contractor shall, at his own expense, conform to all anti-malaria instructions given to him by the Engineer.	Contractor / Supervision Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
4.28	First Aid	Temporary	Minor	At every workplace, a readily available first aid unit including an adequate supply of sterilized dressing material and appliances will be provided as per the Factory Rules. Suitable transport will be provided to facilitate transfer of injured or ill person(s) to the nearest hospital. At every workplace and construction camp, equipment and nursing staff shall be provided.	Contractor / Supervision Consultant
4.29	Hygiene	Temporary	Minor	All temporary accommodation must be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing. Garbage bins must be provided in the camps and regularly emptied and the garbage disposed off in a hygienic manner. Adequate health care is to be provided for the work force. Unless otherwise arranged for by the local sanitary authority, the local medical health or municipal authorities shall make arrangement for disposal of excreta. On completion of the works, all such temporary structures shall be cleared away, all rubbish burnt, excreta tank and other disposal pits or trenches filled in and effectively sealed off and the outline site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the engineer.	Contractor / Supervision Consultant
4.30	Religious Structures	Temporary	Major	All necessary and adequate care shall be taken to minimize impact on cultural properties (which includes cultural sites and remains, places of worship, graveyards, monuments and any other important structures as identified during design and all properties/sites/remains notified under the Ancient Sites and Remains Act). No work shall spill over to these properties, premises and precincts. Access to such properties from the road shall be maintained clear and clean.	Contractor / Supervision Consultant
4.31	Archaeological Property – Chance find if any	Temporary	Minor	The contractor shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing and shall, immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out the Engineer's instructions for dealing with the same, awaiting which all work shall be stopped 100 m all directions from the site of discovery. The Engineer shall seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence work on the site.	Contractor / Supervision Consultant
4.32	Clearing of Construction of Camps & Restoration	Temporary	Major	Contractor to prepare site restoration plans for approval by the Engineer. The plan is to be implemented by the contractor prior to demobilization. On completion of the works, all temporary structures will be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the Engineer.	Contractor / Supervision Consultant
4.22	Road furniture	Temporary	Minor	All roadside structures / furniture, protection, intersections, traffic islands, rotaries, facilities and amenities etc. shall be constructed as per engineering design and to the satisfaction of the engineer. Similarly restoration of bus shelters including bus bays, other infrastructure etc. affected during laying of water pipelines and other water supply facilities shall be carried out as per design and to the satisfaction of the engineer.	Contractor / Supervision Consultant
5	**O&M Impacts**				
5.1	Environmental Conditions	Permanent	Moderate	The PIU will undertake seasonal monitoring of air, water, noise and soil quality through an approved monitoring agency. The parameters to be monitored, frequency and duration of	PHED

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				monitoring as well as the locations to be monitored will be as per the Monitoring Plan prepared.	
5.2	Road users and the local populace can get adversely impacted during the routine maintenance operations of the rising mains.	Temporary	Moderate	Proper maintenance practices shall be adhered to. Road users to be given prior intimation and alternate arrangement for traffic to be considered.	PHED

VI. Institutional Requirements

A. Institutional Arrangements

61. The PHED, as the Implementing Agency (IA) will undertake all actions for the implementation of the project. PHED will have one specialist identified to overseeing the implementation of the EMP, and will be outsourced. An Environmental Officer (consultant) shall be inducted within the PHED to address the environmental impacts due to the project. The identified officer should be a Civil Engineer specializing in Environment or a related field with experience in the management of infrastructure projects. S/he should be similar with Indian legislation and the implementation of multi/bilateral loan projects.

62. Roles and Responsibilities

- Review of IEE and other environment documents based upon ADB's Environmental Assessment Guidelines, or other multilateral or bilateral agency guidelines, as required.
- Liaise and obtain clearances from with required state and central departments for clearances and compliance to regulations.
- Monitor and oversee the implementation of the Environmental Management Plan
- Ensure inclusion of EMP in contractor's ToRs.
- Oversee implementation and monitor compliance to the EMP
- Undertaken required interactions with civil society groups and community for projects under implementation
- Ensure inclusion of public concerns and grievances in EMP and project implementation. Undertake dialogue with affected communities, as required.
- Review environmental performance of project through periodical environmental monitoring reviews. Where additional environmental safeguards are identified incorporate them in project design, construction or implementation or other follow-up actions, as required.
- Provide required support for the management of environmental concerns in the implementation of the project
- Develop, review and plan and implement training and capacity building for contractors and consultants involved in the project

63. A consultant shall be hired for supervising construction activities. This agency will need an officer identified for overseeing the implementation of the EMP. The roles and responsibilities of this individual will be,

- Work closely with Corporation's environmental specialist for the implementation of EMP and ensure compliance to environmental safeguards, support its implementation
- Work with Corporation's environmental specialist for getting environmental clearances for the project
- Review of EMP implementation and advice the Corporation's environmental specialist on the implementation status
- Review any changes in project design, identify environmental safeguards if required and work with the Corporation's environmental specialist to reflect identified safeguards in EMP
- Ensure all identified systems – safety, accident management and control, waste are in place, functioning and implementing personnel have adequate training to implement actions
- Consultation with stakeholders and inclusion of their concerns in project implementation
- Incorporate additional environmental safeguards as required during project implementation.

B. Environmental Monitoring Plan

64. Prior to developing a monitoring plan there is a need for the development of a baseline for some activities. This would help with the monitoring activities. The baseline is described below.

1. Development of a baseline

65. Prior to developing a monitoring plan there is a need for the development of a baseline for some activities. This would help with the monitoring activities. The baseline is described below.

Sl. No.	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Responsibility	Cost estimates INR
1	Air Quality	Pre construction	SPM and RSPM, NOx, CO		Once prior to construction	DPR consultant	4000/sample
2	Noise	Pre construction	Decibels	At two locations along the rising main alignment and two locations within the settlement where networks to be developed	Once prior to construction	DPR consultants	1000/sample
3	Water quality	Pre construction	Surface water quality	In the water source.	Once, prior to construction	DPR consultants	2000/ sample
4	Site for quarries and borrow pits	Pre construction	The site situation – for rehabilitation, photographs	All sites identified for quarries, borrow pits, waste and construction labour camps and offices	Once prior to construction	DPR consultants/ agency identified to supervise construction	30,000 lump sum
5	Vegetation removal	Pre construction	Vegetative survey to identify type and amount of vegetation that requires to be replaced	Along locations that are to be cleared off trees for construction activities	Once prior to construction	DPR consultants	300000 lump sum
4	Site for borrow pits, construction camps etc	Pre-construction	Visual quality, nature and type of vegetation, soil quality etc	Quarries, borrow pits, waste and construction labour camps and offices sites	Once prior to construction	Contractor	100,000 total

2. Monitoring Actions

Sl. No.	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Responsibility	Cost estimates INR
1	Air Quality	Construction	SPM and RSPM, NOx, CO	At two locations along the rising main alignment, and two locations within the settlement where networks to be developed	Thrice annually	Contractor	4000/sample
2	Noise	Construction	Decibels	At two locations along the rising main alignment, and two locations within the settlement where networks to be developed	Thrice annually	Contractor	1000/sample
3	Water quality	Construction	Surface water quality	At two water body locations along the rising main alignment,	Thrice annually	Contractor	2000/sample
4	Site for borrow pits, construction camps etc	PostConstruction	After construction activity over – if rehabilitated	Quarries, borrow pits, waste and construction labour camps and offices sites	After completion of construction activities at site	Contractor	40,000 total

C. Training & Capacity Building

66. The training programme will start with a Sensitization Workshop for officials of PHED and also the Contractor's personnel. Typical modules that would be present for the training session would be as follows:

- Sensitization
- Introduction to Environment Considerations in Urban Development Projects
- Review of IEE and Integration into Design

- Improved Co-ordination within Nodal Departments, on special issues, if any.
- Role during construction
- Monitoring & Reporting System

67. The proposed training program along with the frequency of sessions is presented in the table below.

Program	Description	Participants	Form of Training	Duration	Trainer / Agency
Introduction and sensitisation to environment issues	Sensitisation on environmental concerns ▪ Environmental impacts of road's projects ▪ GoI environmental regulations ▪ ADB/multilateral/bilateral environmental regulations ▪ Coordination between departments for implementation of environmental safeguards	PHED officials responsible for implementing project and office in-charge of implementing environmental safeguards	Workshop	Half day workshop	External Consultants/ NCRPB
EMP implementation	Implementation of environment EMP ▪ Identification of environment impacts ▪ Monitoring and reporting for EMP ▪ Public interactions and consultations ▪ Reporting and coordination ▪ Coordination for consents and with various departments ▪ Monitoring formats filling and review of impacts	PHED officials, officer in-chare of project implementation, identified officer in-charge of implementing EMP	Lectures and field visit	Two/three day session	External Consultants/ NCRPB
Recurring training programmes	Management of Environmental impacts Identification of Environmental impacts Environmental regulations Environmental monitoring and review	PHED officials, officer in-chare of project implementation, identified officer in-charge of implementing EMP	Lecture and interactive session	One day session	External Consultants/ NCRPB

D. Environmental Budget

68. As part of good engineering practices in the project, there have been several measures as erosion prevention, rehabilitation of borrow areas, safety, signage, provision of temporary drains, etc the costs for which will be included in the design costs. Therefore, these items of costs have not been included in the IEE budget. Only those items not covered under budgets for construction and RP are costed in the IEE budget. The IEE costs include mitigation, monitoring and capacity building costs. The summary budget for the environmental management costs for the project is presented in the following table.

Sl. No.	Particulars	Stages	Unit	Total number	Rate (INR)	Cost (INR)

Sl. No.	Particulars	Stages	Unit	Total number	Rate (INR)	Cost (INR)
A.	Mitigation Measures					
1	Ensuring occupational safety for workers at camps and construction sites	Construction	Lump sum			200,000.00
2	Undertaking compensatory plantation	Construction	Lump sum			200,000.00
3	Reduction of disturbance to local population and businesses during construction	Construction	Lump sum			100,000.00
4	Relocation of utilities and provision of temporary services during construction	Construction	Lump sum			300,000.00
5	Management of dust and sand during construction activities	Construction	Lump sum			100,000.00
	Sub -Total (A)					900,000
B.	Monitoring Measures					
	Air	Pre-construction	Sample	24	4000	96000
	Air	Construction	Sample	96	4000	384000
	Noise	Pre-construction	Sample	24	1000	24000
	Noise	Construction	Sample	96	1000	96000
	Water	Pre-construction	Sample	6	2000	12000
	Water	Construction	Sample	72	2000	144000
	Rehabilitation of borrow pits etc	Pre-construction and construction	Lump sum			30000
	Vegetative survey					150000
	Sub -Total (B)					936000
C	Capacity Building					
	Pre –construction		Lump sum			472000
	Construction		Lump sum			187000
	Sub-Total (C)		Lump sum			659000
	Total (A+B+C), INR					2495000

VII. Public Consultation and Information Disclosure

A. Process of Consultation Followed

69. During the preparation of the project, consultations with stakeholders were held on environmental issues with PHED, communities and affected persons. Summary of the consultations undertaken is given in Table below.

Table 2: Summary of Consultations

S.No.	Place	Date	Number of participants	Participants	Issues discussed
1	PHED, Gurgaon Office	26 October, 2009	2	Officers of the PHED	The need for the scheme – the quality of the water and the water sustainability. The present water supply network is old, damaged and in part made of plastic pipes. Tree roots have in places broken these pipes resulting in contamination of the supplied water and lowering the total water supplied in the town. Due to construction activity water supply network, has been buried deep in places and there is no map, making it difficult to access and repair.
2	Pataudi			Elected representatives	Requirement for a water supply system that ensures even even pressure to all parts of the town Present water supply network is not for whole city and the pressure is low Many areas not covered by existing schemes are using groundwater, however this water is contaminated by city's sewage The present water supply network is old, damaged and also consists in parts of plastic pipes. Tree roots have in places broken these pipes resulting in contamination of the supplied water and lowering the total water supplied in the town. Construction activities in town have lead to the network being broken at times, also the network has become deeper as land has been filled up, reducing access for repairs and management of system It was suggested that canal be considered for sourcing drinking water as pumping groundwater would be unsustainable in the long run given the present rapidly decreasing water levels in the aquifers.
2	Pataudi	26 October,		Councillors	Since there are a number of drinking water tubewells in the town the water of

S.No.	Place	Date	Number of participants	Participants	Issues discussed
		2009			these tubewells gets contaminated by the sewage, leading to diarrhoeal diseases. The demand for a sewerage system is higher than that of water in Pataudi as it is considered essential; however as the present water availability is insufficient for the development of a sewerage system therefore it is felt that both water supply and sewerage projects for the area should be developed together. The people feel that they will be willing to pay for the convenience of a sewerage system
3.	Rewari Road,Pataudi	26 October, 2009	3	Shop owners and keepers	There was no objection to the construction activities that may occur when the water and sewer network is laid. During the discussions it was also identified that some of the major roads tend to be congested during the sowing and harvesting in the rabi and kharif seasons due to large vehicles, tractors and harvesters on the road. Therefore, while there is no objection on excavation and pipe laying activities for the sewerage system it may be better to time the construction activities to avoid these periods. These would be October-November, March, July and September.
4.	Pataudi town	26 October, 2009	10	Residents	All persons discussed with understand the benefits for a improved water supply and sewerage system and would like the town to have a proper system.

B. Framework for continued public participation

70. A grievance redressal cell will be set up within the PHED to register grievances of the people regarding technical, social and environmental aspects. This participatory process will ensure that all views of the people are adequately reviewed and suitably incorporated in the design and implementation process. Further, to ensure an effective disclosure of the project proposals to the stakeholders and the communities in the vicinity of the project locations, an extensive project awareness campaigns will be carried out.

71. For the benefit of the community the Summary IEE will be translated in the local language and made available at: (i) Office of the PHED Division at Sohana, (ii) Office of the District Commissioner, Gurgaon district. These copies will be made available free of cost to any person seeking information on the same. Hard copies of the IEE will be available in the PHED office as well as the local library, and accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. On demand, the person seeking information can obtain a hard copy of the complete IEE document at the cost of photocopy from the office of the Divisional office of the PHED at Sohana, on a written request and payment for the same. Electronic version of the IEE will be placed in the official website of the PHED and the website of ADB after approval of the documents by Government and ADB. The PHED will issue notification on the disclosure mechanism in local newspapers, ahead of the initiation of implementation of the project, providing information on the project, as well as the start dates etc. The notice will be issued in

local newspapers one month ahead of the implementation works. This will create awareness of the project implementation among the public. Posters designed to mass campaign the basic tenets of the IEE will be distributed to libraries in different localities that will be generating mass awareness.

VIII. Findings and Recommendations

72. It is to be noted that as per the statutory requirements of Government of India (Environmental Impact Assessment Notification, September 2006, and its subsequent amendment 2009) Environmental Impact Assessments are not required for the proposed sub project. The proposed development does not fall either in Category A or in Category B as per GoI EIA requirements. The significance of the environmental impacts will be more due to the construction related impacts than any impacts associated with areas of rich environmental sensitivity. It is to be noted that the resultant potential impacts from these proposals can be offset through provision of proven mitigation measures during the design and adoption of good engineering practices during construction and implementation. EMP prepared to this affect addresses these potential impacts through appropriate mitigation, management and monitoring measures.

73. The effective implementation of the measures proposed will be ensured through the building up of capacity towards environmental management within the PHED supplemented with the technical expertise of an Environmental Specialist as part of the Supervision Consultants. Further, the environmental monitoring plans prepared as part of the EMP will provide adequate opportunities towards course correction to address any residual impacts during construction or operation stages.

74. Apart from construction related impacts the major impacts during operation f the facilities include: Poor management, leakage and breakages in the system leading to contamination of supplied water, accidents at the WTP impacting workers at the site, spills of chemicals stored at the WTP, leading to contamination of the area. To address these, there will be a need for proper monitoring, management and maintenance of the system to ensure that leakages do not take place or controlled in time, if they occur.

IX. Conclusions

The project will have a number of benefits such as availability of clean and sufficient drinking water to all the residents of Pataudi and Hailey Mandi. Also, as at present there is insufficient water for the development of a proper sewerage system, the local population has been suffering from contamination of groundwater and due to leakages of soak pits and septic tanks into local drains and onto the roads. With the availability of water, as planned by this project, a sewerage system can be developed, further improving the health of the residents of the towns. Also, considering the low levels of environmental impacts expected it will not require any major mitigation. The proposed components should proceed through to design and implementation, subject to mitigation measures and monitoring programs as per EMP for potential impacts identified in the IEE. These will be updated and detailed during detailed design stage, and based on above recommendations. It may be emphasized that the present IEE, which identifies potential impacts and EMP which presents appropriate mitigation measures, is sufficient enough to safeguard the environment. There are no significant adverse impacts, which are irreversible or may lead to considerable loss/destruction of environment, envisaged. All the impacts are generic and have proven mitigation measures to minimize/mitigate the same.

X. Appendix 1: REA Checklist

WATER SUPPLY

Instructions:

- This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
- Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: Pataudi Water Supply, NCRPB,India

Sector Division:

SCREENING QUESTIONS	Yes	No	REMARKS
A. PROJECT SITING IS THE PROJECT AREA…	☐	☐	
▪ DENSELY POPULATED?	■	☐	
▪ HEAVY WITH DEVELOPMENT ACTIVITIES?	■	☐	There are a number of development activities expected as this is a part of a fast growing area of the NCR
▪ ADJACENT TO OR WITHIN ANY ENVIRONMENTALLY SENSITIVE AREAS?			
• CULTURAL HERITAGE SITE	☐	■	
• PROTECTED AREA	☐	■	

SCREENING QUESTIONS	Yes	No	REMARKS
• WETLAND	☐	■	
• MANGROVE	☐	■	
• ESTUARINE	☐	■	
• BUFFER ZONE OF PROTECTED AREA	☐	■	
• SPECIAL AREA FOR PROTECTING BIODIVERSITY	☐	■	
• BAY	☐	■	
B. POTENTIAL ENVIRONMENTAL IMPACTS Will the Project cause…			Water Supply, page 2
▪ pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?	☐	■	
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?	☐	■	
▪ hazard of land subsidence caused by excessive ground water pumping?	☐	■	
▪ social conflicts arising from displacement of communities ?	■	☐	The WTP and intake structure will create displacement and is to addressed in the Resettlement Plan
▪ conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?	☐	■	
▪ unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?	☐	■	
▪ delivery of unsafe water to distribution system?	☐	■	

SCREENING QUESTIONS	Yes	No	REMARKS
▪ inadequate protection of intake works or wells, leading to pollution of water supply?	☐	■	
▪ over pumping of ground water, leading to salinization and ground subsidence?	☐	■	
▪ excessive algal growth in storage reservoir?	☐	■	
▪ increase in production of sewage beyond capabilities of community facilities?	☐	■	
▪ inadequate disposal of sludge from water treatment plants?	☐	■	
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?	☐	■	
▪ impairments associated with transmission lines and access roads?	■	☐	During construction there will be disruption of infrastructure and the different departments need to be involved at the time to ensure least possible disruption
▪ health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.	☐	■	
▪ health and safety hazards to workers from the management of chlorine used for disinfection and other contaminants?	■	☐	Accidents can take place and an appropriate safety plan is to be a part of the project design
▪ dislocation or involuntary resettlement of people	■	☐	This will be addressed in the Resettlement Plan
▪ social conflicts between construction workers from other areas and community workers?	☐	■	
▪ noise and dust from construction activities?	■	☐	Timing, low noise machines, etc are to be used to reduce noise and dust disturbances
▪ increased road traffic due to interference of construction activities?	■	☐	Appropriate timing and use of alternate paths for traffic can help reduce traffic disruption
▪ continuing soil erosion/silt runoff from construction operations?	■	☐	Some concerns will exist, especially at burrow pits and appropriate design rehabilitation is required
▪ delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?	☐	■	

SCREENING QUESTIONS	Yes	No	REMARKS
▪ delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?	☐	■	
▪ accidental leakage of chlorine gas?	■	☐	May occur and the technical design needs to include an accident management plan
▪ excessive abstraction of water affecting downstream water users?	☐	■	
▪ competing uses of water?	☐	■	
▪ increased sewage flow due to increased water supply	■	☐	This will occur, however a sewerage system is also planned
▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant	☐	■	

Environmental Assessment Document

B. PATAUDI SEWERAGE PROJECT

Table of Contents

I. INTRODUCTION

A. Background

1. The Project aims to promote growth and balanced development of the whole National Capital Region through providing economic base in the identified major settlements (Metro Centres/Regional Centres) for absorbing economic development impulse of Delhi, efficient transport network, development of physical infrastructure, rational land use pattern, improved environment and quality of life. In line with the objectives of the Regional Plan, the primary objective of this project are to improve quality of life and well-being of urban residents in the National Capital Region (NCR): This will be achieved by way of support to various agencies in the constituent States through NCRPB a line of credit to compliment the ongoing efforts of NCRPB in financing the regional Plan priorities and technical assistance to improve quality of planning, design and management interventions in the region. To address the twin business propositions of the National Capital Region Planning Board (NCRPB), – planner of relevance and a strategic financier, - the ADB line of credit comprises of an investment loan USD 140 million and a TA component of USD 10 million. The projects to be taken up are typical of regions needs –small town water and sanitation, connectivity investments and transport infrastructure which provides multi modal transport linkages.

2. 'Augmentation of water supply and waste water management infrastructure for Pataudi town' as proposed by the PWD – Public Health Engineering Department (PWD – PHED), Govt. of Haryana (GoH) and submitted to the National Capital Region Planning Board (NCRPB) for financing. The sub-project also includes part of the adjoining town of Haily Mandi-Jatauli which is just about 4 km on north-west of Pataudi and due to its natural slope being towards the site proposed for sewage treatment plant (STP). This Initial Environmental Examination (IEE) assesses the environmental impacts due to the proposed sewerage sub-project, which includes Sewage Treatment Plant (STP) and laying of the sewer network in Pataudi and Hailey Mandi in Haryana.. The IEE specifies measures towards addressal of the impacts. The IEE has been prepared based on a review of sub-project designs; field visits, and secondary data to characterize the environment and identify potential impacts; and consultations with stakeholders. An Environmental management plan (EMP) outlining the specific environmental measures to be adhered to during implementation of the sub-project has been prepared.

B. Compliance to ESMS of NCRPB

3. Recognizing the environmental and social issues that can arise in infrastructure projects, NCRPB has prepared a Draft Environmental and Social Management Systems (ESMS) in line with ADBs safeguard requirements for Financial Intermediaries (FIs). The ESMS provides an overall management system to NCRPB to identify, assess, and mitigate environmental and social issues that are likely to arise in projects financed by NCRPB and implemented by Implementing Agencies (IAs). The ESMS outlines the policies, methods of assessments and procedures that will enable NCRPB to ensure that a project that it funds is developed in accordance with ESMS and is adequately protected from associated risks. IAs will have to comply with the ESMS conditions while submitting their loan application. This IEE has been prepared in line with the ESMS of NCRPB.

C. Purpose of the IEE

4. The proposed components will result in positive environmental impacts. The proposed components will result in positive environmental impacts. While the sub-project components have been accommodated to the extent possible within the available RoW and Government lands, land acquisition is required (of an extent of xx hectares). Given the magnitude of civil works, there would be typical construction related impacts, and could be mitigated by appropriate mitigation measures and adoption of good construction practices. Further, these will be of limited intensity and of short duration. None of the project interventions as part of these proposed road improvements are proposed within locations in or near sensitive and valuable

ecosystems, including protected areas and forests. Therefore, as per the ESMS, the sub-projects are categorized as 'B' and an IEE carried out. This IEE provides mitigation measures for impacts related to construction, operation, and maintenance.

D. Environmental Regulatory Compliance

5. The EIA Notification of the MoEF, September 2006, does not warrant environmental clearance from the MoEF for sewerage projects. Further the general conditions specifying triggers[1] for Category A projects are not envisaged due to the proposed sub-project. However, the project will require consent from Competent Authorities such as the Haryana State Pollution Control Board. The ADB guidelines, stipulate addressing environmental concerns, if any, of a proposed activity in the initial stages of Project preparation. For this, the ADB Guidelines categorizes the proposed components into categories (A, B or C) to determine the level of environmental assessment[2] required to address the potential impacts. The sub-project has been categorized as B. None of the project interventions are proposed within locations in or near sensitive and valuable ecosystems, including protected areas and forests. The sub-project has been categorized as B. Accordingly this IEE is prepared to address the potential impacts. The IEE was based mainly on secondary sources of information and field reconnaissance surveys. Stakeholder consultation was an integral part of the IEE

E. Report Structure

6. This Report contains 8 sections including this introductory section: (i) introduction; (ii) description of project components; (iii) description of the environment; (iv) environmental impacts and mitigation measures; (v) institutional requirements; (vi) public consultation and information disclosure; (vii) finding and recommendation; and (viii) conclusions. An EMP outlining the specific environmental measures during implementation of the sub-project has been prepared.

1 Any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 10 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) inter-State boundaries and international boundaries.

2 Level of environmental assessment required for each category of Project, as per ADB's Environmental Assessment Guidelines 2003 is as follows: (i) Category A. Sub-project components with potential for significant adverse environmental impacts. An environmental impact assessment (EIA) is required to address significant impacts; (ii) Category B. Sub-project components judged to have some adverse environmental impacts, but of lesser degree and/or significance than those for Category A projects. An initial environmental examination (IEE) is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report. (iii) Category C. Sub-components unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are still reviewed.

II. DESCRIPTION OF PROJECT COMPONENTS

A. Project Background

7. Pataudi, a Tehsil town in Gurgaon District with current (2009) estimated population of around 22,000 (16,085 as per Census 2001). It is located on the Gurgaon – Rewari road at a distance of 25 km from Gurgaon and about 58 km from Delhi. Because of its proximity to the rapidly growing city of Gurgaon, being a part of the NCR, having good connectivity with other towns in the region, and expected growth on account of the upcoming special economic zone (SEZ), it assumes significance as an affordable option for absorbing future urban growth.

8. Present water supply in Pataudi and Hailey Mandi is ground water based and the service level is estimated to be around 70 litres per capita per day (lpcd). PWD - Public Health Engineering Department of the GoH is responsible for construction and O&M of water supply. The supply is for about 2-3 hours in the morning and evening each and therefore almost every house also maintains a small storage. In addition, a number of houses and establishments have private bore wells. The department has prepared a sub-project for augmenting water supply to both the towns to 135 lpcd and to this effect submission of a proposal for getting funding from NCRPB is under consideration. As a part of this TA, the water supply sub-project has also been appraised for possible financing and a separate feasibility report has been developed.

9. Both the towns are characterized by the practice of on-site sanitation. Most households having latrines are connected to individual septic tanks and the overflow is let out into open road side drains. Very few houses have septic tanks connected to soak pits or drainage fields. The practice of direct discharge of wastewater into open drains is also prevalent, especially in those houses where space is limited and which are located along large open drains. In monsoon the wastewater from these drains overflows onto roads and at times enters residences, causing a serious threat to public health.

10. Under the above setting, the quality of life in both the towns as determined by the water environment can be defined to be rather low. It is therefore evident that there is a need for making an appropriate intervention whereby the underlying cause, i.e., wastewater/ sewage disposal can be done safely. Moreover as the PHED plans to augment water supply to a level of 135 lpcd in the two towns (from an average of 2 mld to around 7.5 mld each) in a foreseeable future, there will be a need to provide adequate infrastructure for collection and disposal of increased volumes of wastewater.

11. The sewerage sub-project will include (a) laying of branch sewers, laterals, mains and trunk sewers for the entire population of Pataudi, (b) a trunk sewer for the combined flows of the two towns, (c) a pumping

station, (d) a sewage treatment plant (e) and a pumping station and outfall for final disposal of the treated sewage.

B. Description of sub-project components

1. Coverage

12. The sub-project will cover entire population[3] of Pataudi and about 63% population of Hailey Mandi-Jatauli[4] which is residing on the southern side of the railway line and where the general slope of the ground is towards the proposed location of the sewage treatment plant. Although Hailey Mandi is about 3-4 km away, the sub-project has adopted the strategy of including part of its population in order to get the benefit of natural flow pattern and scale, and avoid difficult elements of intermediate pumping and a railway crossing.

2. Sewerage Zones

13. The sub-project can be characterised to be broadly having two sewerage zones – one for the whole of Pataudi and the second for that part of Hailey Mandi-Jatauli which is on the southern side of the railway line and which is nearer to and sloping towards Pataudi. Zone one, i.e., entire area of Pataudi is predominantly sloping southward whereby all the sewage flows by gravity to one point without involving excessive depth of excavation and without entailing provision of intermediate pumping stations. However, this zone can be sub-divided into 5 or 6 sub-zones according to the existing pattern of the habitation. The population distribution over an area of 250 hectare is considered to be uniform, and the population densities for the present and the design year work out to be 91 and 165 persons/ha respectively.

3. Sewerage Network Components

14. Total length of the sewerage network as per the available design lay out for the Pataudi town alone works out to close to 31 km. Out of this, almost 91% length comprises pipes of least diameter i.e., 200 mm which are generally used as primary branch sewers and laterals. Balance 9% length comprises pipes of various sizes ranging from 250 mm to 700 mm. The depth of excavation varies from less than 1m to up to 8 m, however almost 85% of this will be under 3m and less than 10% involves excavation from 5 to 8m depth.

15. All the sewers less than or equal to 400mm in diameter will be salt glazed stone ware pipes while all other large diameter sewers will be RCC NP3 pipes. The laterals shall be of 200 mm to 400 mm and would be connected through manholes or connecting chambers. All laterals shall have inner cement mortar lining.

16. Sewage flows from Hailey Mandi will join at the junction point no. X/10 on the western side of Pataudi. From there on the combined sewage will flow through RCC pipes of 500-700mm upto the sewage pumping station. The depth of excavation in the tail end of this stretch is in the range of 7-8m. The pumping station is to be constructed at the same site where the sewage treatment plant is proposed and therefore the length of the rising main will be very small. The rising main comprise 300mm dia K9 class DI pipes.

17. All necessary appurtenances such as manholes, ventilating shafts, intercepting chambers shall be provided as per the standard practice of sewer construction. Manholes-cum-connecting chambers will be constructed on the sewer lines to facilitate house connections as well as inspection of sewer lines. Manholes will be provided at every junction, change of diameter, and for house connections. The manholes will be of Brick Masonary with SR cement mortar and plaster at all places except in water logged area and RCC (with SR cement) cast-in-situ structures for water logged area. It is however advised that looking to the limitations of time for execution, pre-cast manholes should be considered under the sub-project.

[3] It is noted that under the sub-project the components of laying of sewer lines in the southern and northern parts of Hailey Mandi-Jatauli, outfall sewer from Hailey Mandi to Pataudi and construction of a treatment plant for the sewage flows being generated in the northern part are not included. These components are proposed to be developed under a separate sub-project which is being prepared by PWD-PHED.

[4] While Hailey Mandi has a sewerage line, the line is old and insufficient to cater to the present population. Also, it only covers part of the town as it is about 40 years old.

4. Sewage Pumping Station

18. The sewage pumping station is required at the tail end of the sewerage network and just ahead of the sewage treatment plant. It will essentially work as a lift station as its main objective is to take the combined sewage from a depth of around 8 m and put it in the inlet chamber of the treatment plant. The pump configuration is proposed to comprise five working pumps and one standby pump, each having discharge capacity of 0.5 dry weather flow (DWF) (=75 m^3/hr). The rising main is proposed to be of 300 mm diameter K9 DI pipe. In view of the location of the pumping station being within the treatment plant complex, the length of the rising main will also be very limited.

5. Treatment Technology Options

19. Seven different available and proven technology options for sewage treatment have been evaluated on a rigorous criteria involving diverse parameters e.g., process performance/efficiency, stability, liability of sludge treatment and disposal, level of mechanisation, energy consumption, land requirement, skill requirement, capital and operating costs, etc. The options comprise (a) conventional activated sludge process (b) UASB followed by a polishing pond (c) extended aeration (d) conventional trickling filter (e) waste stabilisation pond (f) facultative aerated lagoon, and (g) 'Moving Bed Bio-reactor' (MBBR). This comparison is presented in Table **.

Table 1: COMPARISION OF AVAILABLE SEWAGE TREATMENT TECHNOLOGY OPTIONS

Parameter	ASP	UASB +FPU	Ex. Aeration	FAL	Trickling filter	WSP	MBBR
Foot print (ha/mld)	0.2	0.3	0.15	0.3	0.3	2.8	0.1
Treatment efficiency (%)	85-92	< 75	> 95	85	90	90	>95
Power consumption (Lakh units/mld/yr)	1.2	0.05	1.8	1.2	0.7	0	0.9
Sludge liability	High	Low	Low	Low	Medium	Low	Low
Skill required	High	Medium	Medium	Low	High	Low	Medium
Life cycle cost (Rs. Lakh/mld)	141	78	155	141	129	173	113

20. Based on this evaluation, the sub-project has decided in favour of MBBR, a compact system which offers the key advantages of low foot print, relatively lower power requirement, least liability of sludge treatment (no digestion required) and disposal, significantly higher treatment efficiency, high process flexibility, stability and robustness, simple and reliable operation, absence of odour and emission of corrosive gases, improved aesthetics, and finally the second lowest life cycle costs. The key deciding aspect has been the low foot print entailing lower land acquisition and lower land costs.

6. Capacity and Phasing Of the Treatment Plant

21. As described in a preceding section on flow estimates, the capacity of the sewage treatment plant in the first phase is kept at 3.75 mld. Although the intermediate design stage is considered as 2025, but depending on the growth of population, water consumption and sewage generation, the second module of equal capacity can be created earlier to meet the increased loads. Based on these considerations, the STP

will be constructed in two modules/phases, while the land acquisition will correspond to the full requirement. As explained earlier, the pumping capacity will also be developed in phases.

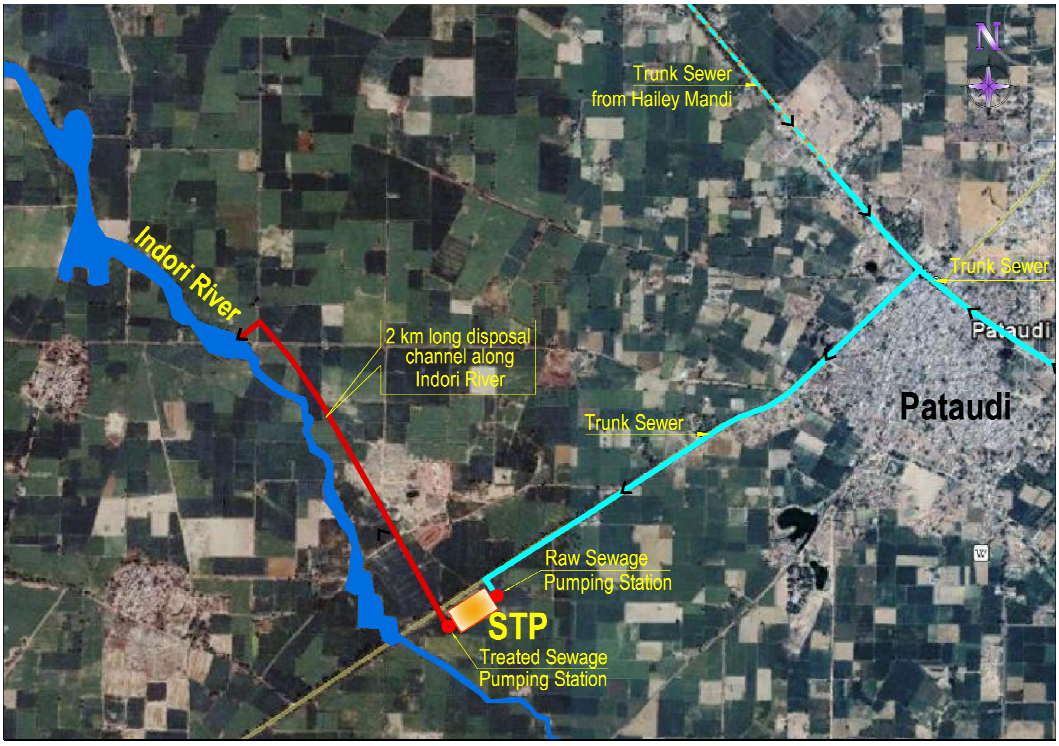
7. Siting Of the Treatment Plant

22. The STP is proposed to be located within 2 km from Pataudi town on the Gurgaon-Rewari Road. As shown in Figure **, the proposed site is an agriculture field which is on the side of the road and also close to a local rivulet called Indori River. This rivulet eventually joins Sahibi river which is a tributary of River Yamuna and joins the latter in the Delhi stretch via the Najafgarh drain. The sub-project involves acquisition of 2.04 hectare of land for construction of STP and pumping station.

8. Disposal Of Treated Sewage

23. The treated sewage will be discharged either into the Indori River or used for irrigation in the agriculture fields in the vicinity. PWD-PHED proposes to auction the rights for use of treated wastewater on an annual basis. In order to help dispose off the treated effluent to agriculture fields in the vicinity, the sub-project includes the component of a final pumping station after the STP and a short channel for 17 mld upto the Indori Drain, approximately 60m long. However, based on field investigations it is perceived that the Indori Drain does not have adequate discharge capacity at or near the proposed point of disposal and it can lead to formation of a lagoon near the culvert/road embankment and inundation of adjoining agriculture fields. However as shown in the Figure **, the Indori River is found to widen about 2 km on downstream and offers fairly adequate discharge capacity. In view of this, it is suggested to consider inclusion of additional works viz., (a) a pond of 6 hour holding capacity within the STP compound (b) a small overflow weir, and (c) a channel of about 2 km until it joins wider section of the drain downstream. These measures will completely address the concern on inadequate discharge capacity of Indori River on one hand while enabling use of water for irrigation as well as contribute to natural recharge.

FIGURE 1: POSITION OF INDORI RIVER IN RELATION TO THE STP



C. Implementation Schedule

24. The sub-project will be implemented by the PHED over a period of 3 years. The pre-project phase includes selection of 'project management consultant' and 'design and supervision consultant', preparation of revised DPR, land acquisition, rehabilitation of project affected people, preparation of bid documents, prequalification and selection of bidders for various construction packages and preparation of 'Shifting of Utilities Plan' and procuring of 'Letter of Approval for Shifting' from concerned agencies. This phase is expected to take around 10-12 months.

III. Description of the Environment

25. Helimandi and Pataudi are neighbouring towns in Pataudi block, situated near the foot-hills of Aravalli hills, in the western part of Gurgaon district of North Indian State of Haryana. This area comes under the National Capital Region (NCR). Pataudi town lies at 28°19' N latitude and 76°46'60" E longitude, at an altitude 240 m (787 feet) above mean sea level (MSL) Nearest airport is at Delhi (48 km). Pataudi Road rail-head links it with Rewari, Gurgaon, New Delhi, Jaipur and other major cities. NH 8 connects this place with Gurgaon (38 km) and Delhi (70 km) by road. These two towns are located in Seismic Zone IV.

A. Physical Environment

1. Terrain

26. Pataudi block has conspicuously flat topography, though the Gurgaon district has diverse physiographic features due to plains on the one side and foot-hill extensions of Aravalli hills on another side. The Pataudi block is an alluvial plain formed by the tributary of River Yamuna, namely Sahibi River. The inland depressions cause drainage problems, leading to water logging in monsoon. The soil is heterogeneous; in some places it is rocky. Alluvial thickness varies from almost insignificant to above 203 m, in and around Pataudi, as revealed by boreholes drilled in this block.

2. Climate

27. The climate of the area is tropical, semi-arid and hot. The climate is characterized by the dryness in air, a hot summer and a cold winter. Average temperature in of the district ranges from 5.1°C in January to 40.5°C in May and June. Four seasons of the district are winter from the end of November to beginning of March, dry summer from March to June, south-west monsoon from last week of July to September and post-monsoon season in October and November. The Pataudi block receives lesser rain-fall than the eastern part of the district. Annual average rainfall in the district is 596 mm, with 28 normal rainy days in a year. Average rainfall in monsoon season is 508 mm (77% of the total rainfall). The air is generally dry during the greater part of the year. Humidity is high in the south-west monsoon season. April and May are the driest months when the relative humidity in the morning is about 30 per cent and in the afternoon less than 20%. Winds are generally light but gain force in the summer and monsoon seasons.

3. Soils

28. Pataudi is a part of the Indo-Gangetic alluvial plains with soils consisting of sand, silt, gravel and kankar. Soil texture varies from sandy to clay with frequent calcium carbonate layers at shallow depths. It is estimated that about 80% of the area is affected by salinity and alkalinity. Tropical and brown soils exist in the north-western extreme, northern and north-eastern parts of the Gurgaon district, where the Pataudi block is situated. In Pataudi and Sohna blocks the organic content of soils is low, i.e., below 0.20%, while in the rest of the district it is 0.20% to 0.40%.

4. Geology

29. The Gurgaon district is occupied by Quaternary alluvium and Pre-Cambrian meta- sediments of Delhi Super Group, represented by Alwar quartizites, mica schists and pegmatite intrusives of the Alwar series and slates of phyllites and quartzites of the subrecent alluvium and sand dunes. The alluvium comprises of thick beds of fine to coarse-grained sand with alternating layers of thin clays. The formations comprise mainly quartzites, slates, phyllites, and schists. The district is rich in kaolin and silica sand.

5. Land Use

30. Total geographical area of Gurgaon district is 1254 sq km., with cultivable land of 1230 sq km. More than 75% of the land is used for agriculture (980 sq km.). Forest cover is little (30 sq km.). Mining is also prevalent in the district. Growth induced by inclusion of the district in the National Capital Region (NCR) gets reflected by increase of land use for residential and industrial purposes.

6. Surface Waters

31. There is no perennial river in the district. Sahibi river passing through the block and rain-fed canals, ponds, and lakes constitute surface water. Gurgaon canal has been constructed at New Okhla Barrage on Yamuna river for irrigation purposes.

7. Groundwater

32. At present Pataudi relies on groundwater for sourcing its drinking water. However, the groundwater sources for the Tehsil are overexploited – use is greater than recharge. Aquifers in parts of Gurgaon district are yielding brackish water, making it unfit for consumption. In Gurgaon there are freshwater aquifers of limited thickness which are underlain by saline water aquifers. The aquifers have limited yielding prospective. The major water bearing strata are the alluvium, sands, silt, kankar and gravel zones of the district. However some areas with weathered quartzite also have semi consolidated sand beds which have a potential for water bearing horizons.

33. Ground water in this area occurs in unconfined and semi-confined condition. The upper zone of saturation consists of fine sand with silt varying from place to place. The pre-monsoon depth of water level in the district ranges from 7.45 m bgl to 52.10 m bgl. The water level is deep in the north-eastern, central and south-eastern parts of the district. The depth of water level in Pataudi block ranges between 20 m bgl to 30 m bgl. The altitude of water table ranges between 176.78 to 274.85m above MSL. In north and western parts of the district, covering Pataudi block, the water table slopes north and north-west, whereas in southern part water table slopes toward southern direction with an average hydraulic gradient of 1.5 m/km. Net annual ground water availability of the district is 20215.12 ham and existing gross ground water draft for all users is 33055.33 ham. In Pataudi block the net annual ground water availability is 4917.64 ham, while the gross annual draft for all uses us 10899.20 ham, showing over-exploitation of 222%. The shallow ground water of the district is alkaline in nature (pH 7.25 to 8.13) and is moderate to highly saline (EC 805 to 3410µS/cm). Ground waters in many areas show high nitrate and fluoride contents, making the water unsuitable for drinking purposes. The mean fluoride concentration in drinking water samples taken at Pataudi, Haileymandi and Harsary village were 1.68±0.35, 3.22± 1.18 and 1.78± 0.12 mg/l (Standard limit – 1.5 mg/l). Similarly, ground water decline in Hailymandi and Bilaspur are 1.2 m/year and 0.77 m/year, respectively. Water parameters recorded in Hailymandi during September 2009 is shown in Table.

Site Name	TDS mg/ l	Total Hardness as CaCo3 mg/ l	Magnesium mg/ l	Chlorides mg/l	Fluorides mg/l	Alkalinity mg/l
Tadapur MLA scheme	1553	340	57.6	450	1.13	300
Todapur – 5	1094	350	60	220	1.44	290
Tatoli Booster	1990	480	86.4	650	0.48	400
Acceptable limit	550	300	30	250	1	300
Permissible limit	2000	600	100	1000	1.5	600

8. Ambient Air quality

34. Ambient air quality monitored near Pataudi block recorded SPM ranging from 95 µg/m^3 (Winter) to 223 µg/m^3 (Summer); RPM ranging from 20 µg/m^3 (Winter) to 61 µg/m^3 (Summer); SO2 ranging from 6 µg/m^3 (Winter) to 21 µg/m^3 (Summer). NOx ranging from 7 µg/m^3 (Winter) to 23 µg/m^3 (Summer). CO values were found to be below the detectable limit of 114.5 µg/m^3. (Source: Central Pollution Control Board report)

9. Ambient Noise Levels

35. The noise levels ranging from 42.1 dB(A) (Monsoon & Post Monsoon) to 52.1 dB(A) (Winter) and 36.3 dB(A) (Monsoon & Winter) to 48.6 dB(A) (Post Monsoon) during the day and night time respectively. These values are within the limits of Ambient Noise Level Standards prescribed by CPCB.

10. Ecological Resources

36. The landuse is predominantly agricultural and there are no forests or protected areas in the vicinity of the Pataudi town. Sultanpur birds' sanctuary and Aravalli hills are the sensitive sites located within 50km of the towns. The trees and shrubs in the area include dhauk (Anogeissus pendula), Anogeissus pendula (dhauk), Acacia leucophlea (ronj), Acacia Senegal (khairi), Acacia nilotica (kikar), Holoptelea integrifolia (papri), Butea monosperma (dhak), Acacia jacquemontii (bambul) and Balanites aegyptiaca (hingo), ziziphus nummularia (jharberi or pala), Ziziphus mauritiana (ber), Crateva adansonia (barna), Capparis deciduas (kair), Diospyros Montana (kaindu) and Euphorbia royleana (thor).

11. Disasters

37. According to the Vulnerability Atlas of India the NCR falls in the,

- High damage risk zone (MSK VIII) for earthquakes
- Very high damage risk zone B (Vb = 50m/s) for wind and cyclone hazards
- Areas liable to floods, which are more site specific and consist of low-lying areas and the flood plain.

38. There are a number of faults and other tectonic features that trigger earthquakes in the NCR. The major ones are, Sohna fault, Aravalli fault, Hidden Moradabad fault in the Indo-Gangetic basin, Sonepat-Delhi-Sohna fault, Junction of Aravalli and Sohna fault, and the Delhi-Haridwar ridge. Earthquakes of intensity lower than four on the Richter scale have originated from 14 epicentres located in the NCR. Two major lineaments, namely Delhi-Hardwar ridge and Delhi- Moradabad fault, pass through the NCR, both having potential of generating earthquakes of magnitude up to 6.5 to 6.7 and normal depth of 30 kms. The NCR lies in the earthquake zone IV, the second highest vulnerable zones with respect to seismic impacts. The proposed designs shall integrate the risks of seismic activities on the project components, through adoption of the standards.

B. Social and Cultural Resources

1. Demographic profile

39. Total population of Pataudi and Haileymandi towns was 16,085 and 17,081, respectively (15.93% and 16.92% of Pataudi taluk). Pataudi taluk has population of 100,957 (6.08% of undivided Gurgoan district). There is no notified scheduled tribe in the State. Demographic profile of the area is shown in the Table:-

Table-...: DEMOGRAPHIC PROFILE OF PATAUDI AND HAILEYMANDI TOWNS

		Haryana State	Gurgaon district (undivided)	Pataudi taluk	Pataudi town	Hailey-mandi town
Total population		21144564	1660289	100957	16085	17081
Urban population (%)		28.92	22.23	32.85		
Rural population (%)		71.08	77.77	67.14		
Sex-ratio	T	861	873	898		
	R	866	876	905		
	U	847	861	884	887	881
SC population (%)	T	19.35	11.32	22.32		
	R	21.36	10.97	21.25		
	U	14.39	12.54	24.52	23.27	25.69
Children below 6 years of age (%)	T	15.78	20.08	15.69		
	R	16.52	21.51	15.50		

		Haryana State	Gurgaon district (undivided)	Pataudi taluk	Pataudi town	Hailey-mandi town
	U	14.00	15.07	16.09	17.48	14.77
Sex-ratio of children below 6 years of age	T	819	858	799		
	R	823	866	801		
	U	808	816	794	801	787
Total Literacy Rate (%)	T	67.91	62.91	74.48		
	R	63.19	57.09	74.45		
	U	79.16	81.71	74.55	67.94	80.58
Female Literacy Rate (%)	T	25.91	47.79	29.41		
	R	22.99	39.79	28.89		
	U	32.85	73.77	30.48	27.06	33.60
Work Participation Rate (%)	T	39.62	37.92	37.37		
	R	42.92	39.57	40.77		
	U	31.49	32.14	30.40	27.93	32.73
Main workers to Total workers (%)	T	74.50	73.79	73.84		
	R	70.05	69.80	70.09		
	U	89.41	91.02	84.10	87.04	81.74
Sex-ratio of total workers	T	466	517	513		
	R	579	611	652		
	U	182	211	231	166	289
Workers in agriculture (%)	T	51.29	40.29	40.14		
	R	68.83	48.27	49.37		
	U	5.93	5.91	14.85	13.04	16.29

(T – Total; R – Rural; U – Urban) Source: Census of India, 2001.

2. Industries

40. Agriculture is the major occupation in the rural areas of the district. Proximity to Delhi and presence in the National Capital Region has witnessed industrial growth in the district. Mining and allied operations are prevalent in this area. Growth of tertiary sector of industry induces further growth in this area.

3. Physical Infrastructure Services

41. Establishment of drinking water supply, sewerage and sanitation facilities are governed by the Water Supply and Sanitation wing of Public Works Department. PHED is also involved in water supply and sewerage disposal. Major towns of the district are provided with sewerage facilities. There is no comprehensive sewerage system in Pataudi. There are however some individual septic tanks. The waste from the septic tanks and other houses is finally disposed in the existing storm water drains of the town, which in turn flows into low lying areas on the outskirts of the town.

42. There is no primary solid waste collection system in Pataudi town with the waste storage and collection points properly identified. Also, there is no at-source waste segregation or waste transportation system. This has resulted in waste dumped both within the town and on the outskirts and could risk the contamination of the groundwater. The Municipal Council also does not have a bio-medical waste disposal system. The estimated solid waste produced in Pataudi and Hailey Mandi is 6 MT/day each.

43. Pautaudi block has a Community Health Centre with 50 beds run by the Health department of the State. Fluorosis is endemic in Pataudi and Haileymandi due to excess concentration of fluoride in drinking water of

IV. Identification of Environmental Impacts and Mitigation Measures

44. The assessment for each of the sub-projects has been carried out for potential impacts during the following stages of the project planning and implementation:

- **Location impacts.** Impacts associated with site selection, including impacts on environment and resettlement or livelihood related impacts on communities
- **Design impacts.** Impacts arising from project design, including the technology used, scale of operations, discharge standards etc
- **Construction impacts.** Impacts resulting from construction activities including site clearance, earthworks, civil works, etc.
- **O&M impacts.** Impacts associated with the operation and maintenance of the infrastructure built in the project.

A. Land acquisition and resettlement impacts

45. In line with ADBs principles of involuntary resettlement planning, the project minimized involuntary resettlement by proposing the project components in Government lands. Land needs to be acquired for the intake and the STP sites. There will also be temporary disruption of households. The following table details out the sub project component and the scope of such impacts. The overall resettlement impacts are to be further avoided or minimized through careful siting during the implementation stages. The Short Resettlement Plan for the project provides for addressing the impacts on non-titleholders and other impacts on temporary structures in accordance with the provisions of the IR Framework for the project.

Impact	Providing sewerage System for Pataudi Town
Permanent Land Acquisition (ha)	5.0 acres
Temporary Land Acquisition (ha)	0
Affected Households (AHs)	6 [a]
Affected Persons (APs)	34
Titled APs	34
Non-titled APs (Encroachers)	0
Female-headed AH	0
IP/ST-headed AH	0
BPL AH	0
Affected Structures	0
Affected Trees/Crops	0
Affected Common Property Resources	0
Average Family Size	5.7
Average Household Income	Rs.5,420/- p.m.

[a] *The 6 households losing their cultivable land will face significant impact.*

B. Environmental Impacts

46. The potential impacts occurring from this project have been identified below.

47. Location impacts are not likely to be significant as there are no major environmentally sensitive areas along the sub-project locations. The location impacts will pertain to

- Land acquisition of 5 ha is envisaged due to the proposed project components. A total of 6 households are likely to be affected. The affected households will be adequately compensated as per the entitlement framework for the project.
- Also, during finalization of the network some cultural properties like temples and shrines may be impacted. This could be in the form of damage or reduced access to the shrine. Similarly there will be trees along the alignment and near the structures. These may need to be removed for construction.
- Considering that this project is concentrated in a town – with a sewerage network laid right through the town, some disturbances to local buildings and cultural properties may be expected. However, a well designed network can ensure minimum, if any, disturbance to such areas. Equally, businesses and people may be disturbed during the construction of the sewerage network.
- The outfall drain – Indori Nadi, has relatively flat topography, therefore appropriate designing may be required to ensure a smooth flow of the treated sewage from the STP so that it does not stagnate in the neighbouring fields.

48. The construction impacts will pertain to

- The construction activities would require space for the temporary office and storage area of construction material. Therefore the storage of construction material will be scattered and in some areas along major roads, disrupting traffic and movement in towns and also access to agricultural fields.
- There can be considerable disturbance and disruption of day-to-day activities of Pataudi and Hailey Mandi due to the construction activities. The towns are rather busy towns, surrounded by agricultural fields and also lying on some major roads like the Hodal – Patada link road. The network will also need to cross these main roads – both while serving the people and to transport the sewerage to the STP. Hence, traffic and businesses on the way can be disrupted.
- Also, as in the towns roads are narrow – in convenience to residents may occur during the laying of the pipelines. Laying of the pipeline may also result in other utilities like the drainage and water pipelines being disrupted.
- Also, during construction access to houses, shops and various amenities in the towns may be disrupted while laying the piped network. Disturbance due to noise, dust and vibrations within the town can be expected during construction.
- Construction hazards to both the workers and the local residents can be expected – mainly from accidents and poor planning. These however are easy to avoid with good planning. Nonetheless, this will require careful attention as in certain months – the sowing and harvest season, would result in heavy traffic in the area from heavy machinery, amplifying possible disruption and hazards in the town.
- Disposal of construction wastes, designated disposal locations for the cut material should be identified prior to initiation of construction activities and got approved by the engineer supervising the construction activities.
- Indiscriminate stockpiling and disposal of construction material may lead to land degradation requiring adherence to good construction practices. Waste management plans, indicating approximate quantities of waste to be generated and the possible disposal locations, to be prepared and implemented.

49. The O&M impacts will pertain to:

- There are no major concerns during the operation phase. During the operation phase the main concerns are that of disruption during maintenance. Disruptions could occur as the piped network and the trunk lines; pass throughout the city and along the main roads. Disruption of traffic in the town during routine maintenance can also be expected, even through much of this will be localised in nature.

50. With this impacts and mitigation measures in view an EMP is worked out and provided as an independent document.

V. Environmental Management Plan

51. Potential environmental impacts identified in the IEE due to implementation of the project components are to be minimized or avoided through appropriate mitigation and avoidance measures mentioned in Table 5. The agencies that are responsible for implementing the measures that are required to be undertaken have been identified.

Table 2: Environmental Impacts and mitigation measures

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
1	**Location Impacts**				
1.1	Land acquisition impacts and for siting the proposed sub-project components	Permanent	Major	Affected land owners will be compensated in accordance to the Resettlement Plan in line with the ESMS of NCRPB	PHED
1.2	Sewer networks are routed along the existing road networks. Impacts pertaining to structural stability and impact on ROW occupants.	Permanent	Major	Design of the primary networks shall be worked out to minimize impacts on structure and occupants (residents/ businessmen)	PHED / DPR consultant
1.3	Location of STP shall involve clearing of vegetation and trees.	Permanent	Minor	It will be ensured that vegetation outside the designated construction site is not affected The designs shall be worked out to have minimum impacts on trees and clearance of vegetation	PHED / DPR consultant
1.4	Stagnation of water from STP in and around the outfall due to flat topography	Permanent	Moderate	Ensure appropriate pumping and other mechanical methods are provided at STP line outfall is provided in the project design.	PHED / DPR consultant
2	**Design and pre-construction Impacts**				
2.1	Alterations of drainage pattern of the site	Permanent	Major	Design of cross drainage structures would be carried out so as to avoid alteration of drainage pattern. Design would be done considering 50 year return flood level to avoid overtopping of the roads and maintain natural drainage	PHED / DPR consultant
2.2	Contamination of drainage channels from soil eroded	Permanent	Major	Project sections shall be designed to avoid cut and fill as far as possible. Where cutting and filling are not avoidable they shall be balanced to encourage reuse of cut material within the project construction site	PHED / DPR consultant
	Cutting of trees and vegetation clearance in the STP, sewer networks.	Permanent	Moderate	Minimize tree-cutting to the extent feasible by exploring alternative design options. Compensatory plantation shall be done as per State Government guidelines and provisions of the ESMS of NCRPB.	PHED / DPR consultant
2.5	Demolition of religious structures like temple	Permanent	Severe[5]	The alignments of the raising mains and other networks, including access roads shall avoid impact on religious structures to the extent feasible. In case the structures could not be avoided, they shall be reconstructed at a location mutually agreed with the local people.	PHED / DPR consultant
2.6	Land Acquisition; Relocation of Public utilities; and Restoration of Access Roads	Permanent	Severe	All community assets such as water storage tanks, community structures, land acquisition involved and the restoration of access roads in regular use by public that are to be affected shall be relocated with prior approval of the concerned local authority as per the R&R policy.	PHED / DPR consultant
3	**Pre-construction Activities by Contractor**				
3.1	Construction Camps – Location, Selection, Design and Layout	Temporary	Moderate	The construction camps will be located at least 500m away from habitations at identified sites. Locate in barren / waste lands and not fertile agricultural land	Contractor / Supervision Consultant

[5] Though this is considered a severe impact, reconstruction of religious structures demolished would offset the severity of impacts.

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				All fuel oil / lubricants loading and unloading areas shall be paved; and have separate storm water collection system for separation of oil / lubricants prior to discharge. Provide adequate water supply, sanitation, septic tanks, soak pits of adequate capacity. Restore the site to its original state after use. Proper training of labourers and management of waste, if any Prepare a waste management plan for the camps, including an appropriate sanitation and drainage system	
3.2	Drinking water availability and water arrangement	Temporary	Severe	The contractor shall be responsible for arrangement of water in every workplace at suitable and easily accessible place for the whole construction period. Sufficient supply of cold potable water (as per IS: 10500) to be provided and maintained. If the drinking water is obtained from an intermittent public water supply then, storage tanks will be provided.	Contractor / Supervision Consultant
3.3	Identification of disposal sites	Permanent	Major	Location of disposal sites shall be finalized only after the Engineer shall certify that these are not located within designated environmentally sensitive zones and confirm that: disposal of the material does not impact natural drainage courses, no endangered / rare flora is impacted by such material, not in the vicinity of settlements and sensitive land uses.	Contractor / Supervision Consultant
3.4	Quarry Operations	Permanent	Major	It has to be ensured that materials are obtained from licensed quarries having environmental clearance. Quality and legality to be examined by the Contractor and copies of environmental clearances for these needs to be submitted prior to sourcing of material.	Contractor / Supervision Consultant
4	**Construction Impacts**				
4.2	Improper stockpiling of construction materials can cause impacts starting from obstruction of drainage, disturbance/ safety hazard to local population, traffic blockage, and lead to land degradation	Temporary	Moderate	Due consideration shall be given for material storage and construction sites such that it doesn't cause any hindrance to daily traffic movement. Stockpiles shall be covered to protect from dust and erosion. Waste management plans, indicating approximate quantities of waste to be generated and the possible disposal locations, to be prepared and implemented.	Contractor / Supervision Consultant
4.4	Quarry / Borrow pits Operations	Permanent	Moderate	Adequate safety precautions shall be ensured during transportation of quarry material from quarries to the construction site. Vehicles transporting the material shall be covered to prevent spillage. Operations to be undertaken by the contractor as per the direction and satisfaction of the Engineer.	Contractor / Supervision Consultant
4.5	Stripping, stocking and preservation of top soil	Permanent	Moderate	The topsoil from borrow areas, areas of cutting and areas to be permanently covered will be stripped to a specified depth of 150mm and stored in stockpiles. The stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and the height of the pile is to be restricted to 2m. Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur. The stockpiles will be covered with gunny bags or tarpaulin. It will be ensured by the contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles. Such stockpiled topsoil will be returned to cover the disturbed area and cut slopes.	Contractor / Supervision Consultant
4.7	Soil Erosion	Permanent	Moderate	Slope protection measures shall be undertaken along slopes where cutting is involved adopting suitable slope protection techniques. The suitability to be decided by the Engineer at	Contractor / Supervision Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				site. The work shall consist of measures as per design, or as directed by the Engineer to control soil erosion, sedimentation and water pollution. All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earthwork or other items of work.	
4.8	Compaction of Soil	Temporary	Minor	To minimize soil compaction construction vehicle, machinery and equipment will move or be stationed in the construction site as designated by the Engineer only. The haul roads for construction materials should be routed to avoid agricultural areas.	Contractor / Supervision Consultant
4.9	Blasting	Permanent	Moderate	Except as may be provided in the contract or ordered or authorized by the Engineer, the Contractor will not use explosives. Where the use of explosives is so provided or ordered or authorized, the Contractor will comply with the requirements of the following besides the law of the land as applicable. The Contractor will at all times take every possible precaution and will comply with appropriate laws and regulations relating to the importation, handling, transportation, storage and use of explosives and will, at all times when engaged in blasting operations, post sufficient warning flagmen, to the full satisfaction of the Engineer. The Contractor will at all times make full liaison with and inform well in advance and obtain such permission as is required from all Government Authorities, public bodies and private parties whomsoever concerned or affected or likely to be concerned or affected by blasting operations. Blasting will be carried out only with permission of the Engineer. All the statutory laws, regulations, rules etc., pertaining to acquisition, transport, storage, handling and use of explosives will be strictly followed.	Contractor / Supervision Consultant
	In laying the primary network, shops may lose income if customers' access is impeded	Temporary	Moderate	Provide for temporary access to allow people & vehicles to cross trench Inform shopkeepers of work in advance.	Contractor / Supervision Consultant
	Proposed laying of the primary network might require relocation of utility lines.	Temporary	Moderate	Ensure that all utilities lost due to the project will be relocated with the prior approval of the concerned agencies.	Contractor / Supervision Consultant
4.13	Soil and Water Pollution due to fuel, lubricants and construction waste	Temporary	Moderate	The fuel storage and vehicle cleaning area shall be stationed at least 300m away from the nearest drain/water body. Oil interceptor shall be provided at construction vehicle parking area, vehicle repair area and workshops ensuring that all wastewater flows into the interceptor prior to its discharge.	Contractor / Supervision Consultant
4.16	Generation of Dust	Temporary	Minor	The contractor shall take every precaution to reduce the levels of dust at construction sites to the satisfaction of the Engineer. All earthwork to be protected/covered in a manner acceptable to the satisfaction of the engineer to minimize dust generation. Clearance shall be affected immediately by manual sweeping and removal of debris, or if so directed by the Engineer, the construction site shall be hosed or watered using necessary equipment.	Contractor / Supervision Consultant
4.18	Emission from Construction Vehicles, Equipment and Machinery	Temporary	Moderate	The discharge standards promulgated under the Environmental Protection Act, 1986 shall be strictly adhered to. All vehicles, equipment and machinery used for construction shall conform to the relevant Bureau of Indian Standard (BIS) norms. All vehicles, equipments and machinery used for construction	Contractor / Supervision Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				shall be regularly maintained to ensure that pollution emission levels comply with the relevant requirements of SPCB and the Engineer. 'PUC' certificates shall be obtained regularly for all vehicles used for the project. Copies shall be submitted regularly to the Engineer.	
4.20	Noise from construction Equipments	Temporary	Moderate	Maintenance of vehicles, equipment and machinery shall be regular and to the satisfaction of the Engineer, to keep noise from these at a minimum. All vehicles and equipment used for construction will be fitted with exhaust silencers. During routine servicing operations, the effectiveness of exhaust silencers will be checked and if found to be defective will be replaced. Notwithstanding any other conditions of contract, noise level from any item of plant(s) must comply with the relevant legislation for levels of noise emission.	Contractor / Supervision Consultant
4.21	Traffic Control and Safety	Temporary	Moderate	The contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, marking flags, lights and flagmen as per Engineer's direction and satisfaction, for the information and protection of traffic approaching or passing through the section under improvement. Before taking up any construction, detailed Traffic Control Plans shall be prepared and submitted to the Engineer for approval, 5 days prior to commencement of work on any section of road. The traffic control plans shall contain details of arrangements for construction under traffic and details of traffic arrangement after cessation of work each day.	Contractor / Supervision Consultant
4.23	Material Handling at Site	Temporary	Minor	All workers employed on mixing asphaltic material, cement, lime mortars, concrete etc., will be provided with protective footwear and protective goggles. Workers, who are engaged in welding works, would be provided with welder's protective eye-shields. Workers engaged in stone breaking activities will be provided with protective goggles and clothing and will be seated at sufficiently safe intervals. The use of any toxic chemical will be strictly in accordance with the manufacturer's instructions. The Engineer will be given at least 6 working days notice of the proposed use of any chemical. A register of all toxic chemicals delivered to the site will be kept and maintained up to date by the Contractor. The register will include the trade name, physical properties and characteristics, chemical ingredients, health and safety hazard information, safe handling and storage procedures, and emergency and first aid procedures for the product.	Contractor / Supervision Consultant
4.25	Safety Measures During Construction	Temporary	Moderate	All relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996 will be adhered to. Adequate safety measures for workers during handling of materials at site will be taken up. The contractor has to comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress. The Personal Protective Equipment for workers on the project shall conform to respective IS codes.	Contractor / Supervision Consultant
4.26	Risk caused by Force Majure	Temporary	Minor	All reasonable precaution will be taken to prevent danger of the workers and the public from fire, flood, drowning, etc. All necessary steps will be taken for prompt first aid treatment of	Contractor / Supervision Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				all injuries likely to be sustained during the course of work.	
4.27	Malaria Risk	Temporary	Minor	The Contractor shall, at his own expense, conform to all anti-malaria instructions given to him by the Engineer.	Contractor / Supervision Consultant
4.28	First Aid	Temporary	Minor	At every workplace, a readily available first aid unit including an adequate supply of sterilized dressing material and appliances will be provided as per the Factory Rules. Suitable transport will be provided to facilitate transfer of injured or ill person(s) to the nearest hospital. At every workplace and construction camp, equipment and nursing staff shall be provided.	Contractor / Supervision Consultant
4.29	Hygiene	Temporary	Minor	All temporary accommodation must be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing. Garbage bins must be provided in the camps and regularly emptied and the garbage disposed off in a hygienic manner. Adequate health care is to be provided for the work force. Unless otherwise arranged for by the local sanitary authority, the local medical health or municipal authorities shall make arrangement for disposal of excreta. On completion of the works, all such temporary structures shall be cleared away, all rubbish burnt, excreta tank and other disposal pits or trenches filled in and effectively sealed off and the outline site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the engineer.	Contractor / Supervision Consultant
4.30	Religious Structures	Temporary	Major	All necessary and adequate care shall be taken to minimize impact on cultural properties (which includes cultural sites and remains, places of worship, graveyards, monuments and any other important structures as identified during design and all properties/sites/remains notified under the Ancient Sites and Remains Act). No work shall spill over to these properties, premises and precincts. Access to such properties from the road shall be maintained clear and clean.	Contractor / Supervision Consultant
4.31	Archaeological Property – Chance find if any	Temporary	Minor	The contractor shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing and shall, immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out the Engineer's instructions for dealing with the same, awaiting which all work shall be stopped 100 m all directions from the site of discovery. The Engineer shall seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence work on the site.	Contractor / Supervision Consultant
4.32	Clearing of Construction of Camps & Restoration	Temporary	Major	Contractor to prepare site restoration plans for approval by the Engineer. The plan is to be implemented by the contractor prior to demobilization. On completion of the works, all temporary structures will be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the Engineer.	Contractor / Supervision Consultant
4.22	Road furniture	Temporary	Minor	All roadside structures / furniture, protection, intersections, traffic islands, rotaries, facilities and amenities etc. shall be constructed as per engineering design and to the satisfaction of the engineer. Similarly restoration of bus shelters including bus bays, other infrastructure etc. affected during laying of water pipelines and other water supply facilities shall be carried out as per design and to the satisfaction of the engineer.	Contractor / Supervision Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
5	**O&M Impacts**				
5.1	Environmental Conditions	Permanent	Moderate	The PHED will undertake seasonal monitoring of water and soil quality through an approved monitoring agency. The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored will be as per the Monitoring Plan prepared.	PHED
5.2	Road users and the local populace can get adversely impacted during the routine maintenance operations of the rising mains.	Temporary	Moderate	Proper maintenance practices shall be adhered to. Road users to be given prior intimation and alternate arrangement for traffic to be considered.	PHED

VI. Institutional Requirements

A. Institutional Arrangements

52. The PHED, as the Implementing Agency (IA) will undertake all actions for the implementation of the project. PHED will have one specialist identified to overseeing the implementation of the EMP, and will be outsourced. An Environmental Officer (consultant) shall be inducted within the PHED to address the environmental impacts due to the project. The identified officer should be a Civil Engineer specializing in Environment or a related field with experience in the management of infrastructure projects. S/he should be similar with Indian legislation and the implementation of multi/bilateral loan projects.

53. Roles and Responsibilities

- Review of IEE and other environment documents based upon ADB's Environmental Assessment Guidelines, or other multilateral or bilateral agency guidelines, as required.
- Liaise and obtain clearances from with required state and central departments for clearances and compliance to regulations.
- Monitor and oversee the implementation of the Environmental Management Plan
- Ensure inclusion of EMP in contractor's ToRs.
- Oversee implementation and monitor compliance to the EMP
- Undertaken required interactions with civil society groups and community for projects under implementation
- Ensure inclusion of public concerns and grievances in EMP and project implementation. Undertake dialogue with affected communities, as required.
- Review environmental performance of project through periodical environmental monitoring reviews. Where additional environmental safeguards are identified incorporate them in project design, construction or implementation or other follow-up actions, as required.
- Provide required support for the management of environmental concerns in the implementation of the project
- Develop, review and plan and implement training and capacity building for contractors and consultants involved in the project

54. A consultant shall be hired for supervising construction activities. This agency will need an officer identified for overseeing the implementation of the EMP. The roles and responsibilities of this individual will be,

- Work closely with Corporation's environmental specialist for the implementation of EMP and ensure compliance to environmental safeguards, support its implementation
- Work with Corporation's environmental specialist for getting environmental clearances for the project
- Review of EMP implementation and advice the Corporation's environmental specialist on the implementation status
- Review any changes in project design, identify environmental safeguards if required and work with the Corporation's environmental specialist to reflect identified safeguards in EMP
- Ensure all identified systems – safety, accident management and control, waste are in place, functioning and implementing personnel have adequate training to implement actions
- Consultation with stakeholders and inclusion of their concerns in project implementation
- Incorporate additional environmental safeguards as required during project implementation.

B. Environmental Monitoring Plan

55. Prior to developing a monitoring plan there is a need for the development of a baseline for some activities. This would help with the monitoring activities. The baseline is described below.

1. Development of a baseline

56. Prior to developing a monitoring plan there is a need for the development of a baseline for some activities. This would help with the monitoring activities. The baseline is described below.

Sl. No.	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Responsibility	Cost estimates INR
1	Air Quality	Pre construction	SPM and RSPM, NOx, CO	At two locations within Pataudi town where networks to be developed	Once prior to construction	DPR consultant	4000/sample
2	Noise	Pre construction	Decibels	At two locations within Pataudi town where networks to be developed	Once prior to construction	DPR consultants	1000/sample
3	Water quality	Pre construction	Surface water quality	In the water source.	Once, prior to construction	DPR consultants	2000/ sample
4	Site for quarries and borrow pits, construction camps etc	Pre construction	The site situation –for rehabilitation, photographs Visual quality, nature and type of vegetation, soil quality etc	All sites identified for quarries, borrow pits, waste and construction labour camps and offices	Once prior to construction	DPR consultants/ agency identified to supervise construction	30,000 lump sum
5	Vegetation removal	Pre construction	Vegetative survey to identify type and amount of vegetation that requires to be replaced	Along locations that are to be cleared off trees for construction activities	Once prior to construction	DPR consultants	300000 lump sum

2. Monitoring Actions

Sl. No.	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Responsibility	Cost estimates INR
1	Air Quality	Construction	SPM and RSPM, NOx, CO	At two locations within Pataudi town where networks to be developed	Thrice annually	Contractor	4000/sample
2	Noise	Construction	Decibels	At two locations in Pataudi town where networks to be developed	Thrice annually	Contractor	1000/sample
3	Water quality	Construction	Surface water quality	At two water body locations along the	Thrice annually	Contractor	2000/sample
4	Site for borrow pits, construction camps etc	PostConstruction	After construction activity over – if rehabilitated	Quarries, borrow pits, waste and construction labour camps and offices sites	After completion of construction activities at site	Contractor	40,000 total

C. Training & Capacity Building

57. The proposed training program along with the frequency of sessions is presented in the table below.

Program	Description	Participants	Form of Training	Duration	Trainer / Agency
Introduction and sensitisation to environment issues	Sensitisation on environmental concerns ▪ Environmental impacts of urban infrastructure projects ▪ GoI environmental regulations ▪ ADB/multilateral/bilateral environmental regulations ▪ Coordination between departments for	PHED officials responsible for implementing project and office in-charge of implementing environmental safeguards	Workshop	Half day workshop	External Consultants/ NCRPB

	implementation of environmental safeguards				
EMP implementation	▪ Identification of environment impacts ▪ Monitoring and reporting for EMP ▪ Public interactions and consultations ▪ Reporting and coordination ▪ Coordination for consents and with various departments ▪ Monitoring formats filling and review of impacts	PHED officials, Officer in charge of implementing this project activities, officer implementing EMP for agency/contractors	Lecture and field visit	Three day session	External Consultants/ NCRPB
Recurring training programmes	Management of Environmental impacts Identification of Environmental impacts Environmental regulations Environmental monitoring and review	PHED officials, officer in-chare of project implementation, identified officer in-charge of implementing EMP	Lecture and interactive session	One day session	External Consultants/ NCRPB

D. Environmental Budget

58. As part of good engineering practices in the project, there have been several measures as erosion prevention, rehabilitation of borrow areas, safety, signage, provision of temporary drains, etc the costs for which will be included in the design costs. Therefore, these items of costs have not been included in the IEE budget. Only those items not covered under budgets for construction and RP are costed in the IEE budget. The IEE costs include mitigation, monitoring and capacity building costs. The summary budget for the environmental management costs for the project is presented in the following table.

Sl. No.	Particulars	Stages	Unit	Total number	Rate (INR)	Cost (INR)
A.	Mitigation Measures					
1	Ensuring occupational safety for workers at camps and construction sites	Construction	Lump sum			200,000.00
2	Undertaking compensatory plantation	Construction	Lump sum			200,000.00
3	Reduction of disturbance to local population and businesses during construction	Construction	Lump sum			100,000.00
4	Relocation of utilities and provision of temporary services during construction	Construction	Lump sum			300,000.00
5	Management of dust and sand during construction activities	Construction	Lump sum			100,000.00
	Sub -Total (A)					900,000
B.	Monitoring Measures					

Sl. No.	Particulars	Stages	Unit	Total number	Rate (INR)	Cost (INR)
	Air	Pre-construction	Sample	24	4000	96000
	Air	Construction	Sample	96	4000	384000
	Noise	Pre-construction	Sample	24	1000	24000
	Noise	Construction	Sample	96	1000	96000
	Water	Pre-construction	Sample	6	2000	12000
	Water	Construction	Sample	72	2000	144000
	Rehabilitation of borrow pits etc	Pre-construction and construction	Lump sum			30000
	Vegetative survey					150000
	Sub -Total (B)					936000
C	Capacity Building					
	Pre –construction		Lump sum			472000
	Construction		Lump sum			187000
	Sub-Total (C)		Lump sum			659000
	Total (A+B+C), INR					2495000

VII. Public Consultation and Information Disclosure

A. Process of Consultation Followed

59. During the preparation of the project, consultations with stakeholders were held on environmental issues with PHED, communities and affected persons. Summary of the consultations undertaken is given in Table below.

Table 3: Summary of Consultations

S.No.	Place	Date	Number of participants	Participants	Issues discussed
1	PHED, Gurgaon Office	26 October, 2009	2	Officers of the PHED	The need for the scheme – the quality of the water and the water sustainability. The problems associated with the current practices of soak pits. Instances of external walls collapsing due to poor designs.
2	Pataudi	26 October, 2009		Councillors	The disposal of waste from the soak pits is poorly managed – while there is a machine to clean the pits there is no regular place for the waste from the pits to be disposed, resulting it being randomly disposed.Many of these pits leak resulting in them either draining into the aquifers or the town's drains, and also contaminates drinking water tubewells in the town While Hailey Mandi has a sewerage system, it is old and inadequate for the present population. Also, as the levels of the road and construction activities have

S.No.	Place	Date	Number of participants	Participants	Issues discussed
					taken place the depth of the sewerage system has gone down. Therefore, at present the sewerage system in some areas has gone as deep as 40 feet. Hence it is felt that a new sewerage system be developed. The present site proposed for STP was discussed and found acceptable as the most suitable location. The demand for a sewerage system is higher than that of water in Pataudi as it is considered essential; however as the present water availability is insufficient for the development of a sewerage system therefore it is felt that both water supply and sewerage projects for the area should be developed together. The people feel that they will be willing to pay for the sewerage system
3.	Rewari Road,Pataudi	26 October, 2009	3	Shop owners and keepers	There was no objection to the construction activities that may occur when the water and sewer network is laid. During the discussions it was also identified that some of the major roads tend to be congested during the sowing and harvesting in the rabi and kharif seasons due to large vehicles, tractors and harvesters on the road. Therefore, while there is no objection on excavation and pipe laying activities for the sewerage system it may be better to time the construction activities to avoid these periods. These would be October-November, March, July and September.
4.	Pataudi town	26 October, 2009	10	Residents	All persons discussed with understand the benefits for a improved water supply and sewerage system and would like the town to have a proper system.

B. Framework for continued public participation

60. A grievance redressal cell will be set up within the PHED to register grievances of the people regarding technical, social and environmental aspects. This participatory process will ensure that all views of the people are adequately reviewed and suitably incorporated in the design and implementation process. Further, to ensure an effective disclosure of the project proposals to the stakeholders and the communities in the vicinity of the project locations, an extensive project awareness campaigns will be carried out.

61. For the benefit of the community the Summary IEE will be translated in the local language and made available at: (i) Office of the PHED Division at Sohana, (ii) Office of the District Commissioner, Gurgaon district. These copies will be made available free of cost to any person seeking information on the same. Hard copies of the IEE will be available in the PHED office as well as the local library, and accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. On

demand, the person seeking information can obtain a hard copy of the complete IEE document at the cost of photocopy from the office of the Divisional office of the PHED at Sohana, on a written request and payment for the same. Electronic version of the IEE will be placed in the official website of the PHED and the website of ADB after approval of the documents by Government and ADB. The PHED will issue notification on the disclosure mechanism in local newspapers, ahead of the initiation of implementation of the project, providing information on the project, as well as the start dates etc. The notice will be issued in local newspapers one month ahead of the implementation works.

VIII. Findings and Recommendations

62. It is to be noted that as per the statutory requirements of Government of India (Environmental Impact Assessment Notification, September 2006, and its subsequent amendment 2009) Environmental Impact Assessments are not required for the proposed Pataudi sewerage subproject. The proposed development does not fall either in Category A or in Category B as per GoI EIA requirements. The significance of the environmental impacts will be more due to the construction related impacts than any impacts associated with areas of rich environmental sensitivity. It is to be noted that the resultant potential impacts from these proposals can be offset through provision of proven mitigation measures during the design and adoption of good engineering practices during construction and implementation. EMP prepared to this affect addresses these potential impacts through appropriate mitigation, management and monitoring measures.

63. The effective implementation of the measures proposed will be ensured through the building up of capacity towards environmental management within the PHED supplemented with the technical expertise of an Environmental Specialist as part of the Supervision Consultants. Further, the environmental monitoring plans prepared as part of the EMP will provide adequate opportunities towards course correction to address any residual impacts during construction or operation stages.

IX. Conclusions

The integrated water supply and sewerage improvement project will have significant benefits to the population. The project will have a number of benefits such as availability of clean and sufficient drinking water to all the residents of Pataudi and Hailey Mandi. Also, as at present there is insufficient water for the development of a proper sewerage system, the local population has been suffering from contamination of groundwater and due to leakages of soak pits and septic tanks into local drains and onto the roads. With the development of the sewerage systems in these towns, the environmental conditions shall be significantly improved. Also, considering the low levels of environmental impacts expected it will not require any major mitigation. The proposed components should proceed through to design and implementation, subject to mitigation measures and monitoring programs as per EMP for potential impacts identified in the IEE. These will be updated and detailed during detailed design stage, and based on above recommendations. It may be emphasized that the present IEE, which identifies potential impacts and EMP which presents appropriate mitigation measures, is sufficient enough to safeguard the environment. There are no significant adverse impacts, which are irreversible or may lead to considerable loss/destruction of environment, envisaged. All the impacts are generic and have proven mitigation measures to minimize/mitigate the same.

X. Appendix 1: REA Checklist

SEWAGE TREATMENT

Instructions:

- This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
- Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: Pataudi Sewerage System, NCRPB, India

Sector Division:

SCREENING QUESTIONS	Yes	No	REMARKS
B. PROJECT SITING IS THE PROJECT AREA…			
▪ DENSELY POPULATED?	■	☐	
▪ HEAVY WITH DEVELOPMENT ACTIVITIES?	■	☐	Pataudi is a fast developing town.
▪ ADJACENT TO OR WITHIN ANY ENVIRONMENTALLY SENSITIVE AREAS?	☐	■	
• CULTURAL HERITAGE SITE	☐	■	

SCREENING QUESTIONS	Yes	No	REMARKS
• PROTECTED AREA	☐	■	
• WETLAND	☐	■	
• MANGROVE	☐	■	
• ESTUARINE	☐	■	
• BUFFER ZONE OF PROTECTED AREA	☐	■	
• SPECIAL AREA FOR PROTECTING BIODIVERSITY	☐	■	
• BAY	☐	■	
A. POTENTIAL ENVIRONMENTAL IMPACTS WILL THE PROJECT CAUSE…			
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?	■	☐	Pataudi is an old town and therefore there are some old buildings. A proper design and alignment of the piped network can ensure that there is no damage or loss takes place.
▪ interference with other utilities and blocking of access to buildings; nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?	☐	■	
▪ dislocation or involuntary resettlement of people	■	☐	The Resettlement Plan will take care of any involuntary resettlement issues that occur.
▪ impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?	☐	■	
▪ overflows and flooding of neighboring properties with raw sewage?	☐	■	
▪ environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?	☐	■	

SCREENING QUESTIONS	Yes	No	REMARKS
▪ noise and vibration due to blasting and other civil works?	■	☐	Noise would be an issue, especially as the laying of the network will be in the town. Machines used for drilling should be identified to ensure least disturbance.
▪ discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?	☐	■	
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?	☐	■	
▪ social conflicts between construction workers from other areas and community workers?	☐	■	
▪ road blocking and temporary flooding due to land excavation during the rainy season?	■	☐	Roads may be blocked – especially some of the main roads due to the construction activities. However, disruption can be reduced by providing alternate routes and ensuring that all activities are carried out during lean traffic periods (such as summer months).
▪ noise and dust from construction activities?	■	☐	Sprinkling of water, using low noise machines and covering soil should be carried out and will reduce disruption.
▪ traffic disturbances due to construction material transport and wastes?	■	☐	Disruption can be reduced by providing alternate routes and ensuring that all activities are carried out during lean traffic periods (such as summer months).
▪ temporary silt runoff due to construction?	☐	■	
▪ hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?	☐	■	
▪ deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?	☐	■	
▪ contamination of surface and ground waters due to sludge disposal on land?	☐	■	
▪ health and safety hazards to workers from toxic gases and hazardous materials which maybe contained in sewage flow and exposure to pathogens in sewage and sludge?	☐	■	

Environmental Assessment Document

C. DEVELOPMENT OF MULTI-MODEL TRANSIT CENTRE AT ANAND VIHAR, NCTD

Table of Contents

I. INTRODUCTION

A. Background

1. The Project aims to promote growth and balanced development of the whole National Capital Region through providing economic base in the identified major settlements (Metro Centres/Regional Centres) for absorbing economic development impulse of Delhi, efficient transport network, development of physical infrastructure, rational land use pattern, improved environment and quality of life. In line with the objectives of the Regional Plan, the primary objective of this project are to improve quality of life and well-being of urban residents in the National Capital Region (NCR): This will be achieved by way of support to various agencies in the constituent States through NCRPB a line of credit to compliment the ongoing efforts of NCRPB in financing the regional Plan priorities and technical assistance to improve quality of planning, design and management interventions in the region. To address the twin business propositions of the National Capital Region Planning Board (NCRPB), – planner of relevance and a strategic financier, - the ADB line of credit comprises of an investment loan USD 140 million and a TA component of USD 10 million. The projects to be taken up are typical of regions needs –small town water and sanitation, connectivity investments and transport infrastructure which provides multi modal transport linkages.

2. This Initial Environmental Examination (IEE) assesses the environmental impacts due to the proposed Anand Vihar MMTC sub-project, at the existing Anand Vihar ISBT. The Anand Vihar ISBT is one of the three ISBTs in Delhi, the other two being at – Kashmiri Gate and Sarai Kale Khan. The MMTC planned at Anand Vihar will facilitate seamless integration of the inter-city and intra city transit options in the area and largely benefit inter modal transfer by transit passengers with reduced transfer times and improved comfort. This will also have significant impact on the utilization of transit services as transfer between local bus to metro rail and interstate bus/train services become very convenient. The metro station is under construction and will be operational in 2010. The proposed MMTC will thus provide significant community benefits and will have a positive impact on the transport movement in the area. The IEE specifies measures towards addressal of the impacts. The IEE has been prepared based on a review of sub-project designs; field visits, and secondary data to characterize the environment and identify potential impacts; and consultations with stakeholders. An Environmental management plan (EMP) outlining the specific environmental measures to be adhered to during implementation of the sub-project has been prepared.

B. Compliance to ESMS of NCRPB

3. Recognizing the environmental and social issues that can arise in infrastructure projects, NCRPB has prepared a Draft Environmental and Social Management Systems (ESMS) in line with ADBs safeguard requirements for Financial Intermediaries (FIs). The ESMS provides an overall management system to NCRPB to identify, assess, and mitigate environmental and social issues that are likely to arise in projects financed by NCRPB and implemented by Implementing Agencies (IAs). The ESMS outlines the policies, methods of assessments and procedures that will enable NCRPB to ensure that a project that it funds is developed in accordance with ESMS and is adequately protected from associated risks. IAs will have to comply with the ESMS conditions while submitting their loan application. This IEE has been prepared in line with the ESMS of NCRPB.

C. Purpose of the IEE

4. The proposed Anand Vihar MMTC subproject will result in positive environmental impacts. None of the project interventions as part of these proposed road improvements are proposed within locations in or near sensitive and valuable ecosystems, including protected areas and forests. The sub-project components have been accommodated within the available lands belonging to the Government and no fresh land acquisition is required (of an extent of xx hectares). Given the magnitude of civil works, there would be typical construction related impacts, and could be mitigated by appropriate mitigation measures and

adoption of good construction practices. Further, these will be of limited intensity and of short duration.. Therefore, as per the ESMS, the sub-projects are categorized as 'B' and an IEE carried out. This IEE provides mitigation measures for impacts related to construction, operation, and maintenance.

D. Environmental Regulatory Compliance

5. The EIA Notification of the MoEF, September 2006, does not warrant environmental clearance from the MoEF for MMTC projects. Further the general conditions specifying triggers[1] for Category A projects are not envisaged due to the proposed sub-project. The project requires clearance from the Delhi Pollution Control Committee under Clause 3 of the Environmental Protection Act, 1986. Although the project plans to reuse its sewerage after cleaning, for any sewerage that may be discharged the MMTC will require clearance under the Water Pollution (Control and Regulation) Act, 1974 amended till 1988.

6. The ADB guidelines, stipulate addressing environmental concerns, if any, of a proposed activity in the initial stages of Project preparation. For this, the ADB Guidelines categorizes the proposed components into categories (A, B or C) to determine the level of environmental assessment[2] required to address the potential impacts. The sub-project has been categorized as B. None of the project interventions are proposed within locations in or near sensitive and valuable ecosystems, including protected areas and forests. The sub-project has been categorized as B. Accordingly this IEE is prepared to address the potential impacts. The IEE was based mainly on secondary sources of information and field reconnaissance surveys. Stakeholder consultation was an integral part of the IEE

E. Report Structure

7. This Report contains 8 sections including this introductory section: (i) introduction; (ii) description of project components; (iii) description of the environment; (iv) environmental impacts and mitigation measures; (v) institutional requirements; (vi) public consultation and information disclosure; (vii) finding and recommendation; and (viii) conclusions. An EMP outlining the specific environmental measures during implementation of the sub-project has been prepared.

1 Any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 10 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) inter-State boundaries and international boundaries.

2 Level of environmental assessment required for each category of Project, as per ADB's Environmental Assessment Guidelines 2003 is as follows: (i) Category A. Sub-project components with potential for significant adverse environmental impacts. An environmental impact assessment (EIA) is required to address significant impacts; (ii) Category B. Sub-project components judged to have some adverse environmental impacts, but of lesser degree and/or significance than those for Category A projects. An initial environmental examination (IEE) is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report. (iii) Category C. Sub-components unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are still reviewed.

II. DESCRIPTION OF PROJECT COMPONENTS

A. Project Components

8. ISBT Anand Vihar is presently functioning on Triangular shaped plot facing a 60 m arterial road, known as Ghazipur Road in east Delhi. The Anand Vihar ISBT is adjacent to Patparganj Industrial Area and is approximately 1 km from the main city Ghaziabad (mainly approached through NH-24) and is located in proximity to residential colonies of East Delhi like Patparganj, Preet Vihar, Anand Vihar, Karkarduma and Krishna Nagar and residential areas of Ghaziabad like Vaishali, Indirapuram and Kaushambi. The objective of the development of MMTC at Anand Vihar is as follows:
    - To redevelop the existing ISBT as Multi Modal Transit Center (MMTC).
    - To decongest the internal city roads by restricting the flow of inter-state buses.
    - To facilitate an effective multi-modal changeover by integrating the existing ISBT with the Anand Vihar Gate Metro station and Railway Station.
    - To provide a state-of-the-art Multi Modal Transit Center that is user friendly, catering to varied passengers' comfort, pedestrian-friendly, ecologically sustainable, handicapped-friendly, and aided with facilities as per best international practices.
9. The total plot area is 102016.92 sq mts. with an effective plot area of 92319.92 sq m. In total an area of 15203.1 sq mts will be the green area and are to be landscaped. The broad project components are:

10. **Inter-State Bus Terminal - (State and Private):** There will be both inter state and local bus terminals at the bus terminal. A total of 168 bus platforms are planned at Anand Vihar. This will include i) bus bays, ii) boarding / aligning platforms, iii) washing and workshop areas, and iv) booking / ticketing counters. Inter State Bus Terminal facility may be located within the downtown core, as a central passenger collection and distribution node, or on the periphery of the core, as a rapid transit feeder station.
11. **Local Bus Terminal** and will include i) bus bays and ii) boarding / aligning platforms. This terminal design is to be based on three main stages related to handling of bus movement - alighting (of passengers), parking (idle) and boarding (of passengers), and their intermediary functions and the smooth and safe movement of passenger to and from modes of city transport. The essential passenger facilities- information, ticketing, waiting & public conveniences value added amenities are to be located within the same building.
12. **Workshop:** The workshop area provided is to connected with the idle parking to facilitate access of the buses in the bay to the maintenance and servicing facilities. There will also be access to the workshop from the boarding and alighting bus bays if required. The workshop area will not be visible to the general public. The services provided at the workshop will include i) repair bays ii) washing bays, iii) spare parts storage, iv) workers amenity and v) administrative office.
13. **Administrative or Terminal Office.** The major functions of this office will be i) ISBT administration, ii) CCTV security room, iii) maintenance office, iv) offices for DTC and roadways. There will also be space for other offices such as DTTDC, Tour Operators.
14. **Passenger facilities.** This will mainly consist of i) dormitories, ii) waiting hall, iii) toilet, iv) cloak room, v) restaurants/ cafeterias. There will also be a number of other passenger and visitor amenities. These will include, tea, coffee, fruit and juice shops. Sweet shops, ice-cream parlours, food and snack shops and restaurants, general merchants, department stores, stationery and newspaper shops, chemists and pharmacists, hair dressers and toilets. Also available will be offices of banks, financial companies, ATMs, yatri-nivas (boarding and lodging), doctors and dentists, insurance company offices and business centres.
15. **Hotel Space.** A 300 room hotel is also planned for the area and land has already been earmarked for it. However, details of the hotel are yet to be identified.

16. **Parking Facility:** These will be available for three-wheelers taxies, rickshaw, and personal vehicles. A "park and ride" terminals with open, paved parking spaces is also planned at the MMTC.

1. Traffic Circulation

17. Traffic circulation of the ISBT designed with conflict free unidirectional movement. Separate entry is provided for Railway station, local buses and interstate buses from the left side of the layout. Exit for all is provided on the right side and hence avoiding the entry and exit conflict and ensure smooth flow of traffic inside the MMTC area. Separate parking space for taxi and auto is provided with unidirectional circulation. The suggested circulation ensures searching all the parking lots in single circulation. Grade separated U turn movement facilities are planned on the main road on both ends of the MMTC and this will ensure smooth exit and entry of vehicles. The construction of this grade separated U turn facilities are not included as part of MMTC development program but is planned to be constructed by Delhi PWD. Construction of this facility on time needs to be ensured for the smooth functioning of the MMTC.

2. Pedestrian Network

18. Integrated pedestrian network is designed to ensure safe and efficient movement of pedestrian. The proposed pedestrian network includes foot over bridges, escalators, lift etc. Pedestrian network needs to be properly integrated with the terminal building floor plans to ensure smooth pedestrian movement across the terminal as bus bays are located on either side of the terminal building.

3. Land Distribution

19. Area statement of Anand Vihar MMTC development is given below.

A	**Land for ISBT owned by Transport Dept of GNCTD**	**10.2 Hector**
B	Land area under Metro	1 Hector
C	Balance are for ISBT (A-B)	9.2 Hector
D	Ground Coverage 25% of (C)	2.273 Hector As / DDA NOC
E	Permissible (FAR = 100)	92000 SqM
F	FAR for ISBT including operational Structures 70% of D	64400 SqM
G	FAR for Hotel 30% of D	27600 SqM
Proposed Covered Area Statement for ISBT		
1	Basement	54241.258
2	Floors (Ground and I to 8)	34787 SqM
3	Achieved Ground Coverage (10515.321/64400*100) Excluding basement	16.328%
4	Achieved FAR (34787/64400*100)	54%

20. The space utilization is within the permissible limits.

4. Road Geometry and Cross section

21. The entry and exit to terminal is provided from Gazipur–Dilshad Garden Road which is a divided road. The turning radius provided varies from 15m to 42m and width of the of the circulation area between the bays ranges from 18 to 20m. The geometry provided satisfies the minimum turning radius for buses.

B. Implementation Schedule

22. The project is planned for a 15 months period. This time frame includes the demolition of the existing site, process, detailed engineering design and the construction activity. There is to be no land acquisition for the MMTC.

III. Description of the Environment

A. Physical Environment

5. Topography

23. The NCT of Delhi forms part of the Indo-Gangetic plains. The Delhi ridge under Aravalli range and Yamuna floodplains are the prominent geographical features of this area. Anand Vihar area lies to the east of Yamuna River. The area is part of the Yamuna Basin comprising the newer alluvium made up of fine to medium, sands, silts, gravel, clay and canker. The alluvial sediments are underlined by hard formations of Delhi system of rock. Altitude is 239 Mtrs above sea level. Delhi's rock formations consist mainly of the Quaternary newer and older alluvium, pre Cambrian Alwar Quartzite. There are also a number of faults in and around the city and are responsible for some of the earthquakes that are felt in the city.

6. Climate

24. The area has a semi-arid climate with high variation between summer and winter temperatures. The temperature varies from 40oC in summer to around 4oC in winter. Summer is from early April to October, with the monsoon season in between. Winter starts in November and peaks in January. The annual mean temperature is 25°C (77 °F); monthly mean temperatures range from 14 °C to 33 °C (58 °F to 92 °F). The average annual rainfall is approximately 714 mm (28.1 inches) with average of 39 rainy days in a year, most of which is during the monsoons in July and August.

7. Water systems

25. The River Yamuna flows from the North to the South dividing the city – with East Delhi lying on one side of the river and the rest of the city on the other side. Apart from River Yamuna there are also a number of drains and water bodies. These include both natural (like the Najafgarh jheel) and manmade systems. The major sources of water in the city are ground water from the city's aquifers and the river bed and the rivers originating from the Himalayans. Groundwater sources in Delhi are assessed to be 292 mcm / year, though the quality of the water varies with some areas having a high TDS, fluorides and nitrates.

26. Anand Vihar is situated near the eastern banks of River Yamuna. The water quality of river Yamuna in the stream nearer to Anand Vihar area reflects the impact of wastewater discharge. The seasonal variations indicate that in Delhi stretch the DO level was always below the prescribed limit during both the seasons. Water quality parameters recorded at River Yamuna at Nizamuddin Bridge during November 2008 and June 2009 are given in Table.

Parameters	Standard	During November 2008	During August 2009
pH	6.0 – 9.0	7.6	7.5
TSS (mg/l)		96	26
COD (mg/l)		64	76
BOD (mg/l)	Less than 3.0	22	23
DO (mg/l)	Less than 4.0	Nil	0.5
TC (MPN/100 ml)	5000	260000	--
NH_3 (mg/l)		--	0.2

Source: Delhi Pollution Control Committee, NCT of Delhi.

8. Ambient Air quality

27. Air quality data observed in Anand Vihar during the period from December 2007 to June 2009 is given in table.

Parameter	NAAQ Standards	Measured in Anand Vihar	Minimum – Maximum for Delhi	Average for Delhi
NO_x (µg/m3)	80.0	12.2 – 204	8.7 – 204	40 – 94
SPM (µg/m3)	200.0	362 – 766	236 – 938	334 – 560
RSPM (µg/m3)	100.0	205 – 399	136 – 485	192 – 313
CO (µg/m3)		1000 – 1455	500 – 2200	835 – 1273
SO_2 (µg/m3)	80.0	5.5 – 22.6	5.0 – 38.2	7.0 – 24.0

Source: Department of Environment, GNCTD

9. Ambient Noise Levels

28. Noise levels in Delhi exceed permissible levels in all areas except industrial areas. The average ambient noise levels are in excess of the prescribed standards during day time. Ambient Noise Levels observed at Anand Vihar and average for NCT of Delhi is given in table.

Location (in dB)	June(2008)		July (2008)		August (2008)		Sep. (2008)		Oct. (2008)		Nov. (2008)		Dec. (2008)		Jan. (2009)	
	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N
Anand Vihar	63.1	57.5	62.5	55.9	63	56	64.3	54.4	62.7	53.9	62	56	61.6	52.7	60.4	53.3
Minimum for Delhi	57.4	48.7	57.1	50.8	56.6	48.3	59.0	51.8	61.1	50.7	59.0	47.1	56.8	47.7	57.6	47.5
Maximum for Delhi	69.0	62.2	65.9	62.3	67.2	62.6	65.0	59.2	64.0	57.4	63.8	60.5	64.4	61.2	64.0	60.8
Average	61.5	55.0	61.0	54.8	61.4	54.5	62.7	55.5	62.4	54.4	61.7	54.5	60.9	54.1	60.5	60.5

(D – Day; N – Night) Source: Department of Environment, NCT of Delhi.

10. Ecological Resources

29. Delhi is relatively rich in wildlife with 2 biodiversity parks, the Aravalli and the Yamuna Biodiversity Parks. There is also the Asola Bhatti Wildlife Sanctuary in Delhi, on the Southern Ridge. Biodiversity significance of Ridge lies in its merger with IndoGangetic plains.
30. Of the total geographical area of 1483 sq km, 7.5% of the area is covered by forests. The total area under Reserved Forests (RF) in Delhi is 78 sq kms and under Protected Forests (PF) 7 sq kms, which is a total of 85 sq kms under protected and reserved forests in the city. Vegetation of Delhi is typical tropical thorn forests and open scrub as found in arid and semi arid areas. Some of the major tree species found in Delhi are Acacias like A. nilotica, A. leucophloea, A. catechu, A. modesta, Butea monosperma (Dhak), Cassia fistula (Amaltas), Salvadora persica. Also found is Anogeissus latifolia and alien species like Prosopis juliflora. Shrubs include capparis sepiaria, C.deciduas, Zizyphus aenoplia, croton sparaiflorus. Herbaceous flora is Calotropis procera, Withania somnifera, Achyranthes aspera, Tridax, Alysicarpus vaginalis, peistrophe bicalyculata. Main grasses in the area are Cenchrus ciliaris, Aristida, Eragrostis poaeioides, Saccharum spontaneum.
31. There are 14 City Forests in Delhi identified by the Delhi Forest Department. The details of these are given below.

S No	Name of City Forest	Area (ha)	District	Remarks
1	Nasirpur City Forest	28	South-West	Fully developed with basic amenities/ facilities for visitors
2	Alipur City Forest	16.80	North	Fully developed with basic amenities/ facilities for visitors
3	Hauz Rani City Forest	28.80	South	Fully developed with basic amenities/ facilities for visitors

S No	Name of City Forest	Area (ha)	District	Remarks
4	Mitraon City Forest	40.00	South – West	Protected Forest, maintained as a city forest
5	Sultanpur City Forest	48.00	North – West	Protected Forest
6	Ghumenhera City Forest	32.00	South – West	Being developed as a City Forest
7	Ghoga City Forest	10.40	East	Being developed as a City Forest
8	Shanapur Garhi City Forest	8.00	North East	Being developed as a City Forest
9	Mamurpur City Forest	56.00	North East	Being developed as a City Forest
10	Jindpur City Forst	47.60	North East	Being developed as a City Forest
11	Mukhmelpur City Forest	27.77	North East	Being developed as a City Forest
12	Bawana City Forest	32	North West	Protected Forest, being maintained as a City Forest
13	Garhi Mandi City Forest	300	East	Being developed as a City Forest
14	Anand Vihar City Forest	32	East	Part of the area has been developed as a Railway Terminal

11. Disasters

32. According to the Vulnerability Atlas of India the NCR falls in the, High damage risk zone (MSK VIII) for earthquakes, Very high damage risk zone B (Vb = 50m/s) for wind and cyclone hazards and areas liable to floods, which are more site specific and consist of low-lying areas and the flood plain.
33. The NCR lies in the earthquake zone IV, the second highest rating in the country. Seismicity around Delhi is associated with the major geological structure, known as the Delhi-Hardwar Ridge. Two major lineaments namely Delhi-Haridwar ridge and Delhi-Moradabad faults passing through the territory have potential of generating earthquakes of magnitude upto MSK VIII.

B. Economic Development

12. Population Characteristics

34. Population of NCT of Delhi was 13,850,507, in Census 2001 with 3.85% annual growth rate and 47.02% decennial growth rate during 1991-2001. 10.57% of the State's population lives in East Delhi. 98.75% of the total population lives in urban areas (78.44% for State). Sex-ratio in urban areas of the district was 843 (State-819). Percentage of children below 6 years of age in urban areas of the district was 14.04% (State-14.59%). Total literacy rate (TLR) in urban areas is 84.94%, as against 81.6% for the State. Similarly, FLR in urban area is 79.25% as against 74.59% for State. 32.38% of population form total work force (WPR), close to the State WPR of 32.7%.

13. Industries

35. The key industries in Delhi are Information Technology, Telecommunications, Hotels, Media, Banking and Tourism. The manufacturing industries of Delhi have also expanded by establishment of many consumer goods manufacturing units and offices in the region. Delhi's large consumer market and its abundance of skilled labor witness growth of tertiary sector of industries. The Delhi State Industrial Development Corporation (DSIDC) is involved in Industrial development in Delhi.

Agriculture is not a major activity in Delhi. Secondary and tertiary sector of industry are major contributories of employment and economic development in the NCT. In East Delhi district 1327 enterprises are in Agriculture, 94152 enterprises are in non-agricultural industries. In South Delhi 264 enterprises are in Agriculture, 104536 enterprises are in non-agricultural industries. Industrial activities include manufacture of food products, tobacco products, textile products, wooden products, paper products, printing and allied industries, leather industries, chemicals, metals and metallic alloys.

IV. Identification of Environmental Impacts and Mitigation Measures

36. The assessment for each of the sub-projects has been carried out for potential impacts during the following stages of the project planning and implementation:

- **Location impacts.** Impacts associated with site selection, including impacts on environment and resettlement or livelihood related impacts on communities
- **Design impacts.** Impacts arising from project design, including the technology used, scale of operations, discharge standards etc
- **Construction impacts.** Impacts resulting from construction activities including site clearance, earthworks, civil works, etc.
- **O&M impacts.** Impacts associated with the operation and maintenance of the infrastructure built in the project.

A. Land acquisition and resettlement impacts

37. Redevelopment of Anand Viahr ISBT does not involve any land acquisition and there is no involuntary resettlement impact and impact to indigenous peoples. All improvement works are proposed within the ISBT campus in land owned by Government of National Capital Territory of Delhi (GNCTD).

38. However, the project will involve relocation of 33 licensed vendors, including 7 government undertaking and cooperatives, to the transit ISBT from where the inter state buses will ply during the construction of MMTC. These licensed vendors are on a one-year lease and thereafter the continuance of a vendor depends upon if he/she is successful in the open bid for the shop/stall/PCO booth. The transit ISBT will accommodate these licensed vendors until the end of their license period and thereafter they will have to take part in the annual bid process.

39. The relocation of the licensed vendors to the transit ISBT will be done overnight without affecting their livelihood and with minimum disturbance to the passengers. Further, the construction is being carried out in a phased manner to minimise impact to passengers and shopkeepers. Consultations with stakeholders and census and socio-economic surveys have reaffirmed that there will be no impact on the livelihood of the shopkeepers in the transit ISBT and the transit arrangement is acceptable to the shopkeepers.

40. In line with the Draft ESMS of NCRPB, projects funded by NCRPB will require a resettlement plan and/or an indigenous peoples plan commensurate with the significance[3] of

[3] As per the Draft ESMS projects are categorized based on the significance of involuntary resettlement and impact to indigenous peoples. Involuntary resettlement categories are (a) Category S-1 (Significant Impact): means 200 or more people will experience major impacts, which are defined as (i) being physically displaced from housing, or (ii) losing 10% or more of their productive assets (income generating). Category S-1 projects require a full resettlement plan; (b) Category S-2 (Not Significant). Category S-2 projects include involuntary resettlement impacts that are not deemed significant and require a short resettlement plan; and (c) Involuntary Resettlement Category S-3: There is no involuntary resettlement impacts and hence does not require any action. Indigenous Peoples categories are (a) S-I Significant impacts are those projects that directly or indirectly affect the dignity, human rights, livelihood systems, or culture of indigenous peoples or affect the territories or natural or cultural resources that Indigenous peoples own, use, occupy or claim as their ancestral domain. Category S-1 projects will require a indigenous peoples plan; (b) S-2 Not Significant are projects where the indigenous peoples are the sole or the overwhelming majority of project beneficiaries, and when only positive impacts are identified. Category S-2 projects will require a summary note on IP in project document; and (c) S-3 are projects where no impacts on indigenous peoples are envisaged and hence does not require any action.

impact. Redevelopment of ISBT at Anand Vihar will come under S-2 category for involuntary resettlement and S-3 category for indigenous peoples as per NCRPB's social categorization.

41. A short resettlement plan has been prepared in line with the Draft ESMS requirements. The summary of resettlement impacts is given in the following table.

Table 1: Summary of Resettlement Impacts

Impact	Redevelopment of ISBT at Anand Vihar
Permanent Land Acquisition (ha)	0
Temporary Land Acquisition (ha)	0
Affected Households (AHs)	0
Affected Persons (APs)	0
Titled APs	0
Non-titled APs (Leaseholders/Renters and Workers/Employees)	0
Licensed private vendors facing minimal disruption	26[a]
Licensed government/cooperative owned outlets	7
Female-headed AH	3
IP/ST-headed AH	0
BPL AH	0
Affected Structures	0
Affected Trees/Crops	0
Affected Common Property Resources	8[b]
Average Family Size	5.0
Average Household Income	Rs.11,244/- p.m.

[a] *These 26 households will only face minimal disruption during one overnight shifting to the transit ISBT*

[b] *The 4 each public toilets and drinking water points are being replaced in adequate number in the transit ISBT*

B. Environmental Impacts

14. Location impacts

42. This project is not planned on an environmentally sensitive or culturally important area, and there are no major location or design impacts from this project. Anand Vihar MMTC is on an existing inter-state bus terminus which will be upgraded to MMTC. Due to the proposed expansion, A few trees will be felled. However the overall impact is expected to be small as the landscaping activities is to include the plantation of trees and therefore will be taking care of the impact of trees felled.

43. To address environmental impacts associated with increased consumption of water and energy, increase, sewage generation during operation of the MMTC, the design incorporates environmentally friendly techniques including reuse of water, dual water use systems and good energy management to reduce the overall impact from the project.
44. Given that the sub-project is located in seismic zone IV (the second highest category for earthquake intensities under the Indian classification system) the designs are worked out to ensure that appropriate ISO codes are used in case of earthquakes, given that Delhi is classified as zone IV –.

15. Construction Impacts

45. There will be the expected occupational safety and hazards associated with any construction site. Dismantling and disposing of asbestos shelters, which have been used in the earlier bus stand presently located at the site, shall be taken up in accordance with the provisions prescribed.
46. Though not significant, impacts from construction including setting of temporary offices, camp sites, storage of construction material, vehicles, increased traffic and noise from generators and other activities at the construction site shall require addressal. Given that the roads leading to the Anand Vihar MMTC are at present also being used for construction activities for the planned metro and railway station, resulting in inconvenience to existing offices and passengers at the site as the bus terminal will be operational even during the construction phase.
47. Waste disposal from the site will however be an issue that will require some attention as apart from waste expected from typical construction activities (soil and waste material, vehicle parts etc.) there will also be waste from the dismantling of the existing bus terminal. The waste disposal shall be done in sites identified for debris disposal by the MCD.

16. O&M Impacts

48. Wastes generated from the MMTC operations would require disposal systems. The waste generation shall include different types of wastes, apart from the management of the liquid waste there will also be food waste, waste from washing and the workshop, cleaning chemicals, packaging and waste from offices. It is expected that much of the water for the MMTC will be sourced from local aquifers. Considering the declining water table in the region, it is suggested that appropriate water conservation and recharge actions be undertaken. Many of these are designed in the project, such as recycling and reusing water and rainwater harvesting.

49. There is also likely to be an increase in the total sewage from the area. In order to deal with this the project has already designed a treatment system – with the sewage after treatment to be reused for irrigation and such purposes. However, care needs to be taken to ensure that there are no leakages and the system does not contaminate the groundwater.

V. Environmental Management Plan

50. Potential environmental impacts identified in the IEE due to implementation of the project components are to be minimized or avoided through appropriate mitigation and avoidance measures mentioned in Table 5. The agencies that are responsible for implementing the measures that are required to be undertaken have been identified.

Table 1: Environmental Impacts and mitigation measures

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
1	**Location Impacts**				
2	**Design and pre-construction Impacts**				
	Clearing of vegetation and trees within the MMTC site	Permanent	Minor	Tree cutting shall be restricted to a minimum, and it will be ensured that vegetation outside the designated construction site is not affected.. Obtain clearance for the cutting of trees from the Forest Department and planning for tree plantation for compensation and green belt development. The landscape plan of the Anand Vihar MMTC shall include: sufficient green cover and tree/plant buffers to reduce the noise and other impacts on the area, landscaping activities with species to reduce impact from increase in noise, dust and air pollution and appropriate landscaping designs.	DIMTS & DPR Consultants
	Alterations of drainage pattern of the site resulting in water logging and flooding.	Permanent	Major	Ensure design identifies appropriate drainage needs and includes it in the design plans of the area, including assessing if existing drainage systems will be able to handle the drainage, or make appropriate alternate arrangements.	DIMTS & DPR Consultants
	The project plans to source some of its water from bore wells, with 3 borewells already available at the premises. Considering the existing trends of lowering groundwater table, the continuing withdrawal of water from these borewells may result in i) unsustainable drawdown, and ii) long run reduced water availability	Permanent	Major	Plans / design to undertake demand management practices, like using water saving devices, reusing and recycling water and harvesting rainwater.	
2.2	Sewage generation (estimated as 1,800 KLD) from toilets, various offices and shops. The total quantum of wastewater will increase with a concentration of various activities in the area.	Permanent	Moderate	The designs shall include provisions for treatment of waste water generated. Ensure that STP can take the required load and has the ability to undertaken appropriate treatment of the sewage/effluents.	DIMTS & DPR Consultants
	Accidents may increase due to the increased traffic in the area due to MMTC operations	Temporary	Moderate	Appropriate design including pedestrian walkways, signages and other appropriate measures to ensure safety of MMTC users and pedestrians	DIMTS & DPR Consultants
	Energy requirements due to enhanced operations and expansion of the terminal	Permanent	Negligible	The designs to include efforts to minimize energy conservation. Choose appropriate power saving methods to reduce power consumption, e.g. use of CFLs, intelligent building systems for energy conservation, energy-efficient chillers. Use solar lighting in open spaces. Reduce the need of lighting in buildings through measures as roof insulation.	DIMTS & DPR Consultants
3	**Pre-construction Activities by Contractor**				

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
3.1	Temporary offices, construction Camps – Location, Selection, Design and Layout	Temporary	Moderate	All fuel oil / lubricants loading and unloading areas shall be paved; and have separate storm water collection system for separation of oil / lubricants prior to discharge. Provide adequate water supply, sanitation, septic tanks, soak pits of adequate capacity. Restore the site to its original state after use. Proper training of labourers and management of waste, if any Prepare a waste management plan for the camps.	Contractor / Supervision Consultant
3.2	Drinking water availability and water arrangement	Temporary	Severe	The contractor shall be responsible for arrangement of water to the workers at suitable and easily accessible place for the whole construction period. Sufficient supply of cold potable water (as per IS: 10500) to be provided and maintained.	Contractor / Supervision Consultant
3.3	Identification of disposal sites for construction debris	Permanent	Major	Locations designated by the MCD for debris disposal shall be utilized for disposal of construction debris. These shall be finalized only after certification from the Engineer.	Contractor / Supervision Consultant
3.4	Quarry Operations	Permanent	Major	It has to be ensured that materials are obtained from licensed quarries having environmental clearance. Quality and legality to be examined by the Contractor and copies of environmental clearances for these needs to be submitted prior to sourcing of material.	Contractor / Supervision Consultant
4	**Construction Impacts**				
4.2	Improper stockpiling of construction materials can cause impacts starting from obstruction of drainage, traffic blockage	Temporary	Moderate	Due consideration shall be given for material storage and construction sites such that it doesn't cause any hindrance to daily traffic movement. Stockpiles shall be covered to protect from dust and erosion.	Contractor / Supervision Consultant
4.4	Quarry / Borrow pits Operations	Permanent	Moderate	Adequate safety precautions shall be ensured during transportation of quarry material from quarries to the construction site. Vehicles transporting the material shall be covered to prevent spillage. Operations to be undertaken by the contractor as per the direction and satisfaction of the Engineer.	Contractor / Supervision Consultant
4.5	Stripping, stocking and preservation of top soil	Permanent	Moderate	The topsoil from borrow areas, areas of cutting and areas to be permanently covered will be stripped to a specified depth of 150mm and stored in stockpiles. It will be ensured by the contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles. Such stockpiled topsoil will be returned to cover the disturbed area and used for landscaping of the site.	Contractor / Supervision Consultant
4.13	Soil and Water Pollution due to fuel, lubricants and construction waste	Temporary	Moderate	Oil interceptor shall be provided at construction vehicle parking area, vehicle repair area and workshops ensuring that all wastewater flows into the interceptor prior to its discharge.	Contractor / Supervision Consultant
	Dismantling and disposal of Asbestos Cement Roofing sheets	Permanent	Major	The asbestos wastes shall be disposed off safely to the hazardous wastes landfill site facility managed by the MCD. The dismantling, transportation and disposal shall be taken up under the supervision of the environmental specialist of the Engineer	Contractor / Supervision Consultant
4.16	Generation of Dust	Temporary	Minor	The contractor shall take every precaution to reduce the levels of dust at construction sites to the satisfaction of the Engineer. All earthwork to be protected/covered in a manner acceptable to the satisfaction of the engineer to minimize dust generation. Clearance shall be affected immediately by manual sweeping and removal of debris, or if so directed by the Engineer, the construction site shall be hosed or watered using necessary equipment.	Contractor / Supervision Consultant
4.18	Emission from Construction Vehicles, Equipment and Machinery	Temporary	Moderate	The discharge standards promulgated under the Environmental Protection Act, 1986 shall be strictly adhered to. All vehicles, equipment and machinery used for	Contractor / Supervision Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				construction shall conform to the relevant Bureau of Indian Standard (BIS) norms. All vehicles, equipments and machinery used for construction shall be regularly maintained to ensure that pollution emission levels comply with the relevant requirements of SPCB and the Engineer. 'PUC' certificates shall be obtained regularly for all vehicles used for the project. Copies shall be submitted regularly to the Engineer.	
4.20	Noise from construction Equipments	Temporary	Moderate	Maintenance of vehicles, equipment and machinery shall be regular and to the satisfaction of the Engineer, to keep noise from these at a minimum. All vehicles and equipment used for construction will be fitted with exhaust silencers. During routine servicing operations, the effectiveness of exhaust silencers will be checked and if found to be defective will be replaced. Notwithstanding any other conditions of contract, noise level from any item of plant(s) must comply with the relevant legislation for levels of noise emission.	Contractor / Supervision Consultant
4.21	Increased risk of accidents for passengers due to common circulatory area for passengers and construction traffic	Temporary	Moderate	The contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, marking flags, lights and flagmen as per Engineer's direction and satisfaction, for the information and protection of traffic approaching or passing through the section under improvement.	Contractor / Supervision Consultant
4.23	Material Handling at Site	Temporary	Minor	All workers employed on mixing asphaltic material, cement, lime mortars, concrete etc., will be provided with protective footwear and protective goggles. Workers, who are engaged in welding works, would be provided with welder's protective eye-shields. The Engineer will be given at least 6 working day's notice of the proposed use of any chemical. A register of all toxic chemicals delivered to the site will be kept and maintained up to date by the Contractor. The register will include the trade name, physical properties and characteristics, chemical ingredients, health and safety hazard information, safe handling and storage procedures, and emergency and first aid procedures for the product.	Contractor / Supervision Consultant
4.25	Safety Measures During Construction	Temporary	Moderate	All relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996 will be adhered to. Adequate safety measures for workers during handling of materials at site will be taken up. The Personal Protective Equipment for workers on the project shall conform to IS codes.	Contractor / Supervision Consultant
4.26	Risk caused by Force Majure	Temporary	Minor	All reasonable precaution will be taken to prevent danger of the workers and the public from fire, flood, drowning, etc. All necessary steps will be taken for prompt first aid treatment of all injuries likely to be sustained during the course of work.	Contractor / Supervision Consultant
4.27	Malaria Risk	Temporary	Minor	The Contractor shall, at his own expense, conform to all anti-malaria instructions given by the Engineer.	Contractor / Supervision Consultant
4.28	First Aid	Temporary	Minor	At every workplace, a readily available first aid unit including an adequate supply of sterilized dressing material and appliances will be provided as per the Factory Rules. Suitable transport will be provided to facilitate transfer of injured or ill person(s) to the nearest hospital. At every workplace and construction camp, equipment and nursing staff shall be	Contractor / Supervision Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				provided.	
4.29	Hygiene	Temporary	Minor	All temporary accommodation must be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing. Garbage bins must be provided in the camps and regularly emptied and the garbage disposed off in a hygienic manner. On completion of the works, all such temporary structures shall be cleared away, all rubbish burnt, excreta tank and other disposal pits or trenches filled in and effectively sealed off and the outline site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the engineer.	Contractor / Supervision Consultant
4.31	Archaeological Property – Chance find if any	Temporary	Minor	The contractor shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing and shall, immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out the Engineer's instructions for dealing with the same, awaiting which all work shall be stopped 100 m all directions from the site of discovery. The Engineer shall seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence work on the site.	Contractor / Supervision Consultant
4.32	Clearing of site and restoration	Temporary	Major	Contractor to prepare site restoration plans for approval by the Engineer. The plan is to be implemented by the contractor prior to demobilization. On completion of the works, all temporary structures will be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the Engineer.	Contractor / Supervision Consultant
4.22	Infrastructure facilities and amenities for passengers at the MMTC	Temporary	Minor	All roadside structures / furniture, protection, intersections, facilities and amenities etc. shall be constructed as per engineering design and to the satisfaction of the engineer.	Contractor / Supervision Consultant
5	**O&M Impacts**				
5.1	Environmental Conditions	Permanent	Moderate	DIMTS will undertake seasonal monitoring of noise, air and water quality through an approved monitoring agency. The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored will be as per the Monitoring Plan prepared.	DIMTS
	Treated sewage to meet the pollution standards	Permanent	Moderate	Proper maintenance and management of the sewage treatment plant Periodically renew the consent-to-operate for the sewage treatment plant from the DPCC	DIMTS
D1	Encourage water reuse and minimization of water use	Permanent	Moderate	Proper maintenance of the water reuse, harvesting arrangements in the Complex, including use of treated sewage for landscaping, flushing and HVAC cooling, Use Dual flush WC cisterns wherever possible, Adopt low flow and sensor-based water fixtures, Use drip irrigation system for landscaped areas and ensure rainwater harvesting systems are well-maintained	DIMTS
	Air pollution and safety hazards caused by congestion created by vehicles at entry and exit points	Temporary	Moderate	Ensure all entry and exit points are clear of blockages and traffic in the MMTC runs smoothly Ensure that there is parking space and roads, entrance and exits are free of congestions. Make it mandatory for all buses meant for the bus terminal to wait sufficiently long for passengers to get in or out	DIMTS
	Hazards due to non maintenance of the waste management systems in the MMTC	Temporary	Moderate	Continuous monitoring of the performance of the operators carrying out waste management of the MMTC. Enhancing public awareness, through campaigns, signages etc	DIMTS

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
	MMTC			to adopt proper waste disposal practices	
	Accidents may be expected from the workshop, during loading and unloading and on the roads. Both vehicles and people may be at risk. Accidents like fires may occur due to short circuits, cooking and also the generator used for power.	Temporary	Significant	Identify and implement an accident and emergency management plan, particularly in the workshop area. Ensure all systems are in good order, have fire extinguishers, and ensure adequate ventilation and escape routes, as required. Establish and maintain an emergency response system include a fire fighting system in line with the National Building codes and other relevant IS codes	DIMTS

VI. Institutional Requirements

A. Institutional Arrangements

51. This project is to be implemented by the Delhi Integrated Multi Modal Transit System Ltd (DIMTS)[4]. DIMTS will have one specialist identified to overseeing the implementation of the EMP. An Environmental Officer (consultant) shall be inducted within the DIMTS to address the environmental impacts due to the project. The identified officer should be a Civil Engineer specializing in Environment or a related field with experience in the management of infrastructure projects. S/he should be similar with Indian legislation and the implementation of multi/bilateral loan projects.

52. Roles and Responsibilities

- Review of IEE and other environment documents based upon ADB's Environmental Assessment Guidelines, or other multilateral or bilateral agency guidelines, as required.
- Liaise and obtain clearances from with required state and central departments for clearances and compliance to regulations.
- Monitor and oversee the implementation of the Environmental Management Plan
- Ensure inclusion of EMP in contractor's ToRs.
- Oversee implementation and monitor compliance to the EMP
- Undertaken required interactions with civil society groups and community for projects under implementation
- Ensure inclusion of public concerns and grievances in EMP and project implementation. Undertake dialogue with affected communities, as required.
- Review environmental performance of project through periodical environmental monitoring reviews. Where additional environmental safeguards are identified incorporate them in project design, construction or implementation or other follow-up actions, as required.
- Provide required support for the management of environmental concerns in the implementation of the project
- Develop, review and plan and implement training and capacity building for contractors and consultants involved in the project

53. A consultant shall be hired for supervising construction activities. The Supervision consultant team will include an officer identified for overseeing the implementation of the EMP. The roles and responsibilities of this specialist will be,

- Work closely with DIMTS environmental specialist for the implementation of EMP and ensure compliance to environmental safeguards, support its implementation
- Work with DIMTS environmental specialist for getting environmental clearances for the project
- Review of EMP implementation and advice the DIMTS environmental specialist on the implementation status
- Review any changes in project design, identify environmental safeguards if required and work with the DIMTS environmental specialist to reflect identified safeguards in EMP
- Ensure all identified systems – safety, accident management and control, waste are in place, functioning and implementing personnel have adequate training to implement actions
- Consultation with stakeholders and inclusion of their concerns in project implementation
- Incorporate additional environmental safeguards as required during project implementation.

[4] DIMTS is a Joint Venture Company set up with equal equity of the Government of National Capital Territory of Delhi (GNCTD) and Infrastructure Development Finance Company (IDFC).

B. Environmental Monitoring Plan

54. Prior to developing a monitoring plan there is a need for the development of a baseline for some activities. This would help with the monitoring activities. The baseline is described below.

1. Development of a baseline

55. Prior to developing a monitoring plan there is a need for the development of a baseline for some activities. This would help with the monitoring activities. The baseline is described below.

Sl. No.	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Responsibility	Cost estimates INR
1	Air Quality	Pre construction	SPM and RSPM, NOx, CO	Two sites, one in the present MMTC and one at the entrance	Once prior to construction	DPR consultant	4000/sample
2	Noise	Pre construction	Decibels	Two sites, one in the present MMTC and one at the entrance	Once prior to construction	DPR consultants	1000/sample
3	Water quality	Pre construction	Ground water quality	Tube wells currently in operation within the site	Once, prior to construction	DPR consultants	2000/ sample
4	Site for quarries and borrow pits, construction camps etc	Pre construction	The site situation –for rehabilitation, photographs Visual quality, nature and type of vegetation, soil quality etc	All sites identified for quarries, borrow pits, waste and construction labour camps and offices	Once prior to construction	DPR consultants/ agency identified to supervise construction	30,000 lump sum

2. Monitoring Actions

Sl. No.	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Responsibility	Cost estimates INR
1	Air Quality	Construction	SPM and RSPM, NOx, CO	Two sites, within the construction site, including one in the area of passenger movement	Thrice annually	Contractor	4000/sample
2	Noise	Construction	Decibels	Two sites, within the construction site, including one in the area of passenger movement	Thrice annually	Contractor	1000/sample
3	Water quality	Construction	Surface water quality	Tube wells currently in operation within the site	Thrice annually	Contractor	2000/sample
4	Site for borrow pits, construction camps etc	Post Construction	After construction activity over – if rehabilitated	Quarries, borrow pits, waste and construction labour camps and offices sites	After completion of construction activities at site	Contractor	40,000 total

C. Training & Capacity Building

56. The proposed training program along with the frequency of sessions is presented in the table below.

Program	Description	Participants	Form of Training	Duration	Trainer / Agency
Introduction and sensitisation to environment issues	Sensitisation on environmental concerns ▪ Environmental impacts of urban infrastructure projects ▪ GoI environmental regulations ▪ ADB/multilateral/bilateral environmental regulations ▪ Coordination between departments for	Transport department and DIMTS officials responsible for implementing project and office in-charge of implementing environmental safeguards Contractor's representative	Workshop	Half day workshop	External Consultants/ NCRPB

Program	Description	Participants	Form of Training	Duration	Trainer / Agency
	implementation of environmental safeguards				
EMP implementation	▪ Identification of environment impacts ▪ Monitoring and reporting for EMP ▪ Public interactions and consultations ▪ Reporting and coordination ▪ Coordination for consents and with various departments ▪ Monitoring formats filling and review of impacts	Transport department officials, DIMTS officials Officer in charge of implementing this project activities, officer implementing EMP for agency/contractors	Lecture and field visit	Three day session	External Consultants/ NCRPB
Recurring training programmes	Management of Environmental impacts Identification of Environmental impacts Environmental regulations Environmental monitoring and review	Transport department officials, DIMTS officials, officer in-charge of project implementation, identified officer in-charge of implementing EMP	Lecture and interactive session	One day session	External Consultants/ NCRPB

D. Environmental Budget

57. As part of good engineering practices in the project, there have been several measures as erosion prevention, rehabilitation of borrow areas, safety, signage, provision of temporary drains, etc the costs for which will be included in the design costs. Therefore, these items of costs have not been included in the IEE budget. Only those items not covered under budgets for construction and RP are costed in the IEE budget. The IEE costs include mitigation, monitoring and capacity building costs. The summary budget for the environmental management costs for the project is presented in the following table.

Sl. No.	Particulars	Stages	Unit	Total number	Rate (INR)	Cost (INR)
A.	Mitigation Measures					
1	Management of dust and sand during construction activities – suppression etc	Construction	Lump sum			100,000.00
2	Ensuring occupational safety for workers at camps and construction sites	Construction	Lump sum			200,000.00
	Sub -Total (A)					300,000
B.	Monitoring Measures					
	Air		Per sample	2	4000	8000
	Air		Per sample	8	4000	32000
	Noise		Per sample	2	1000	2000
	Noise		Per sample	8	1000	8000

Sl. No.	Particulars	Stages	Unit	Total number	Rate (INR)	Cost (INR)
	Water quality		Per sample	3	2000	6000
	Water quality		Per sample	12	2000	24000
	Sub -Total (B)					80000
C	Capacity Building					
	Sensitisation, awareness	Pre-construction	Lump sum			472000
	Monitoring and management	Construction	Lump sum			187000
	Sub-Total (C)					659000
	Total (A+B+C), INR					1039000

VII. Public Consultation and Information Disclosure

A. Process of Consultation Followed

58. During the preparation of the project, consultations with stakeholders were held on environmental issues with DIMTS, communities and affected persons. Summary of the consultations undertaken is given in Table below.

Table 2: Summary of Consultations

S.No.	Place	Date	Participants	Issues discussed
1	Anand Vihar	26 October, 2009	Shopkeeper	All businesses were interested in continuing to operate after the new buildings and facilities were developed. Businesses did not object to being shifted to the temporary arrangements as long as they were given appropriate place – shops of equivalent sizes. The drainage, water supply and power at the existing ISBT is considered to be poor. Drinking water is often muddy and unfit for drinking. Waste management was largely seen to be good.
2	Anand Vihar		Bus operators	The drainage, water supply and power at site considered poor Drinking water often unfit for drinking. Clear signages to be in place as for people unfamiliar to area as the existing signs are inadequate. Roads and the heights of the platforms poorly designed, and difficult to use, resulting in inconvenience to passengers. Also, in many cases the passengers had to walk a considerable distance with their luggage, which was not easy. Therefore, it was felt greater safety for pedestrians be considered in the design. Need space for bus staff for sleeping areas, canteens and toilets as problems for them as they needed to rest between the trips. Offices for the private bus operators, which is not considered in the present ISBT was identified as a need. The bus operators also requested for washing areas and a basic workshop for their buses. The need for a dispensary and first aid centre was also raised.
3	Anand Vihar		Waste Managers	Lack of sufficient space for temporary storage Inadequate protection for themselves while handling waste
4	Anand Vihar		Users	The drainage was poor It was suggested that the new ISBT should have sufficient space between platforms and for passengers to walk and alight from buses. Also, crossing roads was not easy. A public addressing system was suggested by some passengers. Clear signage not there and therefore the bus stand can be a bit confusing for new comers Toilets were considered to be dirty and expensive, resulting in a number of visitors at the ISBT unwilling to use them.
5	Delhi		DIMTS	Environmentally sound principles such as recycling and minimisation of resource are planned for Anand Vihar The new facilities should have greenery and proper landscaping to improve the environment of the area.
6	Delhi		Member of Legislation	The present sewerage system in Anand Vihar is in a poor condition, therefore MMTC should consider alternate options for the management of their sewerage to reduce pollution loads Security of people should be ensured by the new facilities

S.No.	Place	Date	Participants	Issues discussed
				The new facilities should have greenery and proper landscaping to improve the environment of the area.

B. Framework for continued public participation

59. A grievance redressal cell will be set up within the DIMTS to register grievances of the people regarding technical, social and environmental aspects. This participatory process will ensure that all views of the people are adequately reviewed and suitably incorporated in the design and implementation process. Further, to ensure an effective disclosure of the project proposals to the stakeholders and the communities in the vicinity of the project locations, an extensive project awareness campaigns will be carried out.

60. For the benefit of the community the Summary IEE will be translated in the local language and made available at Office of the DIMTS, ISBT Kashmere Gate, and the Project Office of the DIMTS at the Anand Vihar Terminal. These copies will be made available free of cost to any person seeking information on the same. Hard copies of the IEE will be available in the DIMTS office, and accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. On demand, the person seeking information can obtain a hard copy of the complete IEE document at the cost of photocopy from the office of the office of the DIMTS, on a written request and payment for the same. Electronic version of the IEE will be placed in the official website of DIMTS and the website of ADB after approval of the documents by Government and ADB. The DIMTS will issue notification on the disclosure mechanism in local newspapers, ahead of the initiation of implementation of the project, providing information on the project, as well as the start dates etc. Furthermore, as this project works towards improving resource use efficiencies there is a need for creation of public awareness on identified issues like management of water and energy.

VIII. Findings and Recommendations

61. It is to be noted that as per the statutory requirements of Government of India (Environmental Impact Assessment Notification, September 2006, and its subsequent amendment 2009) Environmental Impact Assessments are not required for the proposed Anand Vihar MMTC subproject. The proposed development does not fall either in Category A or in Category B as per GoI EIA requirements. The significance of the environmental impacts will be more due to the construction related impacts than any impacts associated with areas of rich environmental sensitivity. It is to be noted that the resultant potential impacts from these proposals can be offset through provision of proven mitigation measures during the design and adoption of good engineering practices during construction and implementation. EMP prepared to this affect addresses these potential impacts through appropriate mitigation, management and monitoring measures.

62. The effective implementation of the measures proposed will be ensured with the technical expertise of an Environmental Specialist as part of the Supervision Consultants. Further, the environmental monitoring plans prepared as part of the EMP will provide adequate opportunities towards course correction to address any residual impacts during construction or operation stages.

IX. Conclusions

63. The proposed sub-project will have significant benefits to the population. Overall the construction of this Anand Vihar MMTC is expected to be beneficial for the area as it ensure the smooth flow of buses and passengers and improve their comfort. Also, considering the low levels of environmental impacts expected it will not require any major mitigation. However, there are a few issues that would require mitigation, for which proven measures have been identified and included in the EMP. The proposed designs include initiatives towards environmentally sound development, incorporating principles of energy conservation, resource minimization, rain water harvesting, energy efficient building designs etc. The proposed components should proceed through to design and implementation, subject to mitigation measures and monitoring programs as per EMP for potential impacts identified in the IEE. These will be updated and detailed during detailed design stage, and based on above recommendations. It may be emphasized that the present IEE, which identifies potential impacts and EMP which presents appropriate mitigation measures, is sufficient enough to safeguard the environment. There are no significant adverse impacts, which are irreversible or may lead to considerable loss/destruction of environment, envisaged. All the impacts are generic and have proven mitigation measures to minimize/mitigate the same.

X. Appendix 1: REA Checklist

URBAN DEVELOPMENT

Instructions:

- This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
- Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: Anand Vihar MMTC. National Capital Region. India

Sector Division:

SCREENING QUESTIONS	Yes	No	REMARKS
A. PROJECT SITING IS THE PROJECT AREA…			
▪ DENSELY POPULATED?	☐	■	The identified site is a bus stand and is to be upgraded to an MMTC. It does not have people living in it.
▪ HEAVY WITH DEVELOPMENT ACTIVITIES?	■	☐	A number of development activities in the area which will be benefited with the development of the MMTC as it will easy access to the area.
▪ ADJACENT TO OR WITHIN ANY ENVIRONMENTALLY SENSITIVE AREAS?			The project is not on or near any culturally or environmentally sensitive area.

SCREENING QUESTIONS	Yes	No	REMARKS
• CULTURAL HERITAGE SITE	☐	■	
• PROTECTED AREA	☐	■	
• WETLAND	☐	■	
• MANGROVE	☐	■	
• ESTUARINE	☐	■	
• BUFFER ZONE OF PROTECTED AREA	☐	■	
• SPECIAL AREA FOR PROTECTING BIODIVERSITY	☐	■	
• BAY	☐	■	
B. POTENTIAL ENVIRONMENTAL IMPACTS WILL THE PROJECT CAUSE…			Urban Development, page 2
▪ impacts on the sustainability of associated sanitation and solid waste disposal systems and their interactions with other urban services.	■	☐	Waste from various activities are expected – both sewerage and solid waste. The project has planned for waste segregation and composting to reduce overall solid waste and an STP for its sewage
▪ deterioration of surrounding environmental conditions due to rapid urban population growth, commercial and industrial activity, and increased waste generation to the point that both manmade and natural systems are overloaded and the capacities to manage these systems are overwhelmed?	☐	■	Safeguards designed in the project like landscaping, reuse and recycling of both solid and liquid waste are expected to be positive on the environment as the present bus terminal does not have any of these systems in place.
▪ degradation of land and ecosystems (e.g. loss of wetlands and wild lands, coastal zones, watersheds and forests)?	☐	■	There are no such systems therefore impact is expected.
▪ dislocation or involuntary resettlement of people	☐	■	No people stay here and therefore they will not be relocated. There are shops and businesses and after construction they can bid for the shop spaces identified as a part of the MMTC.

SCREENING QUESTIONS	Yes	No	REMARKS
▪ degradation of cultural property, and loss of cultural heritage and tourism revenues?	☐	■	There are no such properties in the area
▪ occupation of low-lying lands, floodplains and steep hillsides by squatters and low-income groups, and their exposure to increased health hazards and risks due to pollutive industries?	☐	■	This area is not low-lying or on floodplains. The area is a bus stop which is to be upgraded as a MMTC.
▪ water resource problems (e.g. depletion/degradation of available water supply, deterioration for surface and ground water quality , and pollution of receiving waters?	■	☐	Water for the area is to be taken from groundwater sources, treated and used. However, there are plans for water harvesting, recycling and the reuse of water.
▪ air pollution due to urban emissions?	■	☐	There will be emissions due to the large number of buses and other vehicles plying in the area. The project has tried to compensate this with landscaping with a large number of trees.
▪ social conflicts between construction workers from other areas and local workers?	☐	■	There is expected to be no such impact
▪ road blocking and temporary flooding due to land excavation during rainy season?	☐	■	No such impact anticipated
▪ noise and dust from construction activities?	■	☐	There will be dust and noise from construction activity and therefore machines and vehicles that create least disturbance and are well maintained are suggested. Also, dust sheets and sprinkling of water is suggested to reduce dust.
▪ traffic disturbances due to construction material transport and wastes?	■	☐	It may occur and therefore appropriate timing of transport vehicles is suggested to minimise impact.
▪ temporary silt runoff due to construction?	☐	■	No such impact is anticipated
▪ hazards to public health due to ambient, household and occupational pollution, thermal inversion, and smog formation?	☐	■	Impact not anticipated
▪ water depletion and/or degradation?	■	☐	May occur and therefore the design has planned for an STP and also water harvesting and reuse and efficient use of water
▪ overpaying of ground water, leading to land subsidence, lowered ground water table, and salinization?	☐	■	Landscape activities are expected to ensure sufficient unpaved area and recharge of groundwater table along with the water harvesting activities.
▪ contamination of surface and ground waters due to improper waste disposal?	■	☐	This may occur and proper maintenance of identified systems should minimise any such impact

SCREENING QUESTIONS	Yes	No	REMARKS
▪ pollution of receiving waters resulting in amenity losses, fisheries and marine resource depletion, and health problems?	☐	■	No such impact anticipated

Environmental Assessment Document

D. BADLI BYPASS

Table of Contents

I. INTRODUCTION

A. Background

1. The Project aims to promote growth and balanced development of the whole National Capital Region through providing economic base in the identified major settlements (Metro Centres/Regional Centres) for absorbing economic development impulse of Delhi, efficient transport network, development of physical infrastructure, rational land use pattern, improved environment and quality of life. In line with the objectives of the Regional Plan, the primary objective of this project are to improve quality of life and well-being of urban residents in the National Capital Region (NCR): This will be achieved by way of support to various agencies in the constituent States through NCRPB a line of credit to compliment the ongoing efforts of NCRPB in financing the regional Plan priorities and technical assistance to improve quality of planning, design and management interventions in the region. To address the twin business propositions of the National Capital Region Plannnig Board (NCRPB), – planner of relevance and a strategic financier, - the ADB line of credit comprises of both an investment loan USD 140 million and a TA component of USD 10 million. The projects to be taken up are typical of regions needs –small town water and sanitation, connectivity investments and transport infrastructure which provides multi modal transport linkages.

2. This Initial Environmental Examination (IEE) assesses the environmental impacts due to the Badli bypass in Jhajjar district, Haryana. The IEE specifies measures towards addressal of the impacts. The IEE has been prepared based on a review of sub-project designs; field visits, and secondary data to characterize the environment and identify potential impacts; and consultations with stakeholders. An Environmental management plan (EMP) outlining the specific environmental measures to be adhered to during implementation of the sub-project has been prepared.

B. Compliance to ESMS of NCRPB

3. Recognizing the environmental and social issues that can arise in infrastructure projects, NCRPB has prepared a Draft Environmental and Social Management Systems (ESMS) in line with ADBs safeguard requirements for Financial Intermediaries (FIs). The ESMS provides an overall management system to NCRPB to identify, assess, and mitigate environmental and social issues that are likely to arise in projects financed by NCRPB and implemented by Implementing Agencies (IAs). The ESMS outlines the policies, methods of assessments and procedures that will enable NCRPB to ensure that a project that it funds is developed in accordance with ESMS and is adequately protected from associated risks. IAs will have to comply with the ESMS conditions while submitting their loan application. This IEE has been prepared in line with the ESMS of NCRPB.

C. Purpose of the IEE

4. The proposed components will result in positive environmental impacts. The entire length of the project road is proposed on a green field alignment and the eccentric two lane cross section is proposed for the first phase in such way that the centre line of the proposed four lane centre line will coincide with the centre line of the right of way (A 60m wide strip of land is being acquired for the project to accommodate four lanes). Given the magnitude of civil works, there would be typical construction related impacts, and could be mitigated by appropriate mitigation measures and adoption of good construction practices. Further, these will be of limited intensity and of short duration. None of the project interventions as part of these proposed road improvements are proposed within locations in or near sensitive and valuable ecosystems, including protected areas and forests. Therefore, as per the ESMS, the sub-projects are categorized as 'B' and an IEE carried out. This IEE provides mitigation measures for impacts related to construction, operation, and maintenance.

D. Environmental Regulatory Compliance

5. The realm of environmental regulations and mandatory requirements for the proposed sub-project is shown in Table 1.The Environmental Impact Assessment (EIA) notification, 2006 by the Ministry of Environment and Forests (MoEF, GoI) specifies the mandatory environmental clearance requirements. Accordingly, all projects and activities are broadly categorized in to two categories - Category A and Category B, based on the spatial extent of potential impacts and potential impacts on human health and natural and man-made resources. This project does not require any environmental clearances under the Environmental Protection Act 1986. However, the project will require consent from Competent Authorities such as the Haryana State Pollution Control Board.

Sub-Component	Applicability of Acts/Guidelines	Compliance Criteria
Roads and highways	Environmental (Protection) Act, 1986 (and as amended subsequently in 2006), EIA notification, 2006 and in 2009, categorization of projects into category A and B, based on extent of impacts. All new state highway projects and state highway expansion projects in hilly terrain or in ecologically sensitive areas are categorized as category B projects.	The roads included are district roads and are not state highways. According to the notification, the project roads do not fall under either category A or Category B. Therefore, environment clearance is not required for the project. However, permission for felling of road side trees will be required. Consent for Establishment and Consent for Operation from the State Pollution Control Board will be required.

6. The ADB guidelines, stipulate addressing environmental concerns, if any, of a proposed activity in the initial stages of Project preparation. For this, the ADB Guidelines categorizes the proposed components into categories (A, B or C) to determine the level of environmental assessment[1] required to address the potential impacts. None of the project interventions are proposed within locations in or near sensitive and valuable ecosystems, including protected areas and forests. The sub-project has been categorized as B. Accordingly this IEE is prepared to address the potential impacts, in line with the recommended IEE content and structure for Category B projects. The IEE was based mainly on secondary sources of information and field reconnaissance surveys. Stakeholder consultation was an integral part of the IEE.

E. Report Structure

7. This Report contains 8 sections including this introductory section: (i) introduction; (ii) description of project components; (iii) description of the environment; (iv) environmental impacts and mitigation measures; (v) institutional requirements; (vi) public consultation and information disclosure; (vii) finding and recommendation; and (viii) conclusions. An Environmental management plan (EMP) outlining the specific environmental measures to be adhered to during implementation of the sub-project has been prepared.

[1] Level of environmental assessment required for each category of Project, as per ADB's Safeguards Policy Statement, 2009 and Environmental Assessment Guidelines 2003 is as follows: (i) Category A. Sub-project components with potential for significant adverse environmental impacts. An environmental impact assessment (EIA) is required to address significant impacts; (ii) Category B. Sub-project components judged to have some adverse environmental impacts, but of lesser degree and/or significance than those for Category A projects. An initial environmental examination (IEE) is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report. (iii) Category C. Sub-components unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are still reviewed.

II. DESCRIPTION OF PROJECT COMPONENTS

A. Need for the project

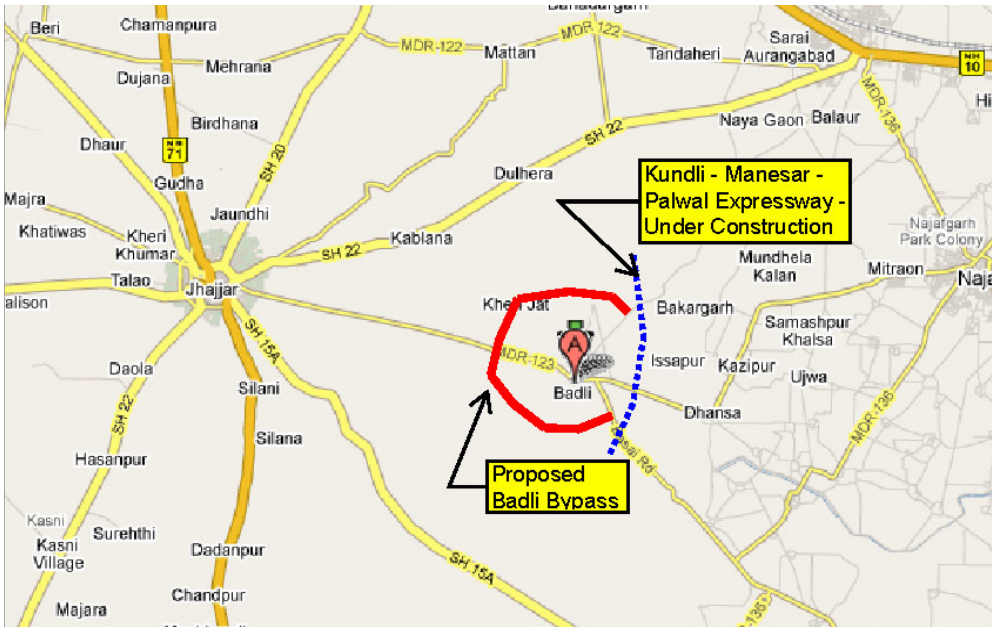
8. The state of Haryana surrounds the National Capital on three sides. The road network of Haryana act as a conduit to enter the National Capital for large number of commercial traffic from Jammu & Kashmir, Punjab, Himachal Pradesh, Rajasthan and Parts of Utter Pradesh. Eight districts of Haryana viz. Faridabad, Mewat, Gurgaon, Rohtak, Sonepat , Rewari, Jhajjar and Panipat are part of the NCR. Many major development projects are taking place in NCR of Haryana, which includes 20 SEZs with an investment of Rs 870 Billion. All this developments also attracts heavy good and industrial traffic to the NCR region of Haryana from surrounding states.

9. The rapid growth in the region is putting pressure on the main road network and especially the towns along these routes with the narrow width and heavy urban traffic. One such town is Badli in Jhajjar district of Haryana where about 8 roads cross the town which includes roads from the major villages around and connecting roads to Delhi, Gurgaon, Jhajjar and Bahadurgarh. Large number of trucks transporting material for the bitumen plants located on the north-east of Badli town. The material is transported from all around Badli town and the output from the bituminous plants mostly transported to various parts of NCTD. In addition, large regional traffic also travels through Badli town resulting in congestion in the town and there is little scope for widening the road through the town. In order to mitigate the transport situation in and around Badli, it is proposed to develop a Bypass to cater to all through traffic which has no business in the town.

10. The traffic studies indicate that more than 50% of the traffic currently going through Badli town is bypassable. This will have a major positive impact on the traffic situation in the town and improve the traffic safety. The savings to the society in terms of vehicle operating with reduced congestion is large enough as can be seen from the economic rate of return of the project and is therefore highly justified in social cost benefit terms.

B. The Proposed Badli bypass alignment

11. The proposed Badli Bypass starts from Km 16/550 of Gurgaon – Bahadurgarh road and its joins the same road at Km 18/580 and will be 5.68 km long connecting 8 roads converging in Badli town. The road is designed as a 4 lane divided carriageway and in the first phase two lane carriageways with paved shoulders will be constructed. The proposal also involves rehabilitation of existing road section of Gurgaon – Bahadurgarh road from Km 16/550 to Km 18/580 and about 1.3 km length of cross roads. The project road location is shown in **Figure 5.1.**



Note: Section of KMP Expressway near Badli only is shown

Figure 5.1: Project Road Location

C. Alignment Description

12. The proposed Badli Bypass, starts from Km 16/550 of Gurgaon – Bahadurgarh road and joins back the same road at Km 18/580. The entire project alignment is traversing through plain terrain and the project corridor is predominantly passing through agricultural land. The subgrade soil is generally silty clay and the entire alignment is proposed on embankment. As the project road alignment is passing through agricultural fields and on embankment, adequate provision of balancing culverts are required to avoid any chance of flooding on one side on the road. The project road alignment in true sense will act as a ring road to Badli town along with Gurgaon – Bahadurgarh road and it crosses six other roads and hence effectively preventing the through traffic from those roads entering to the town center. The cross roads, which will cross the bypass alignment, are given in Table 5.2.

Table 5.2 List of Cross Roads

S No	Crossing Road
1	Rohad Road
2	Goelakalan Road
3	Kheri Road
4	Jhajjar Road
5	Munimpur Road
6	Yakubpur Road

13. The proposed alignment is not crossing any railway line or river. The construction of Palwal-Manesar-Kundli Express way is in progress, which is crossing the Gurgaon – Bahadurgarh road about 100m before the start of the bypass alignment in the north, and again it is crossing the Gurgaon – Bahadurgarh road about 100m after the end of bypass. Presently grade separated crossing is planned for the Expressway without any connection to Gurgaon – Bahadurgarh road.

14. The basic industries located in the Jhajjar district are ceramics, glass, chemicals, engineering, electrical & electronics. The area is under rapid industrial growth owing to its proximity to Delhi. The cross roads on the proposed Badli bypass are frequently used for transportation of stone metals/ crushed material to Gurgaon and capital city of Delhi for development works, as most of the quarries are located across this area. Moreover high growth of heavy traffic is expected as two Thermal Power Plants are proposed to be installed at Chhuchkawas and Badli.
15. The bypass alignment passes through agricultural fields and is also linked to a number of local roads and MDR 123. The area is largely rural with Badli village being surrounded by agriculture fields and brick kilns. Along the alignment only a few trees may require removal for the construction of the road. The area has many brick kilns and the topsoil in part of identified area has been removed and sold to the brick kilns.

D. Design Standards

16. The project road has been proposed to be constructed to a four lane divided carriageway in two phases and two lane with paved shoulder will be constructed in the first phase. Based on the traffic estimate, the second phase may need to be taken up in about 2020. The DPR is prepared for the first phase with adequate provisions for future widening. Considering the requirement of future four laning, 60m wide RoW is proposed in the DPR. The proposed 60m wide RoW will adequately accommodate the utilities, road side plantation, service road etc.

17. The project road is proposed to be designed as per the standards of State Highways. Accordingly IRC 73 "Geometric Design Standards for Rural Highways-1980" published by the Indian Road Congress is referred for finalizing project design standards. The design parameters considered for the project road improvements are summarized in the **Table 5-8**.

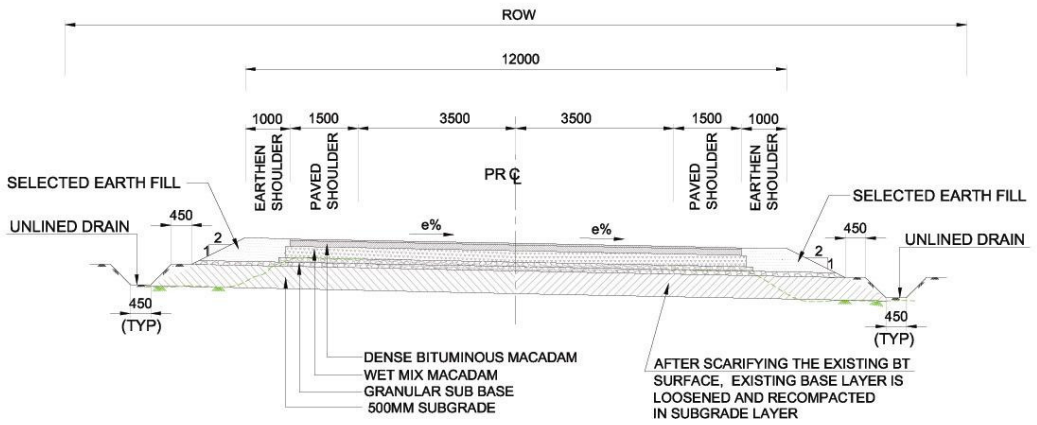
Table 5-8 Design Parameters

S. No	Description	IRC Standards	
1	Design speed Plain and Rolling	Max – Min	100 - 80 km/hr
2	Lane width		3.5 m
3	Paved shoulder width		1.5 m
4	Earthen Shoulder		1.0
5	Road Way Width	Two Lane	12.0 m
6	Right of Way		15 m
7	Cross-slopes	Carriageway Paved shoulder Unpaved shoulder	2.5 % 2.5 % 3.5 %
8	Maximum super elevation		7.0 %
9	Minimum horizontal curve radius	For 100 Km/hr For 80 Km/hr	360 m 230 m
10	Radii beyond which super elevation not required	For 100 Km/hr For 80 Km/hr	1800 m 1100 m
11	Super elevation runoff rate	For Plain and rolling For mountainous & steep	<1 in 150 <1 in 60
12	Transition curves to be used with length of spiral more than or equal to length of super elevation runoff		
13	Extra widening of carriageway on curves	For curve radius >300m 101 to 300m	 Nil 0.6m

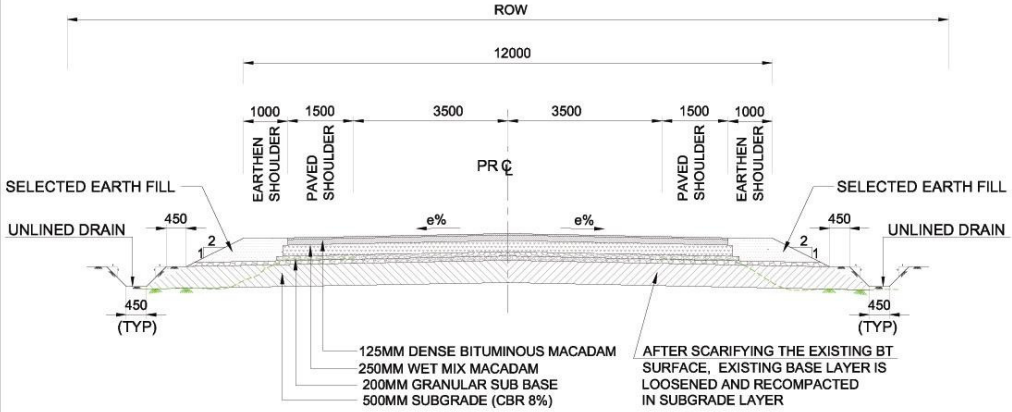
S. No	Description	IRC Standards		
14	Gradient	Ruling Gradient Limiting Gradient Exceptional Gradient	3.3 % 5 % 6.7%	
15	Minimum Length of Vertical Curves / Grade change not requiring vertical curve	Design Speed	min. curve length	max. grade change
		100 km/hr 80 km/hr	60m 50m	0.5% 0.6%
16	Vertical curve 'K' values Crest vertical curve/Sag vertical curve	For design Speed 100 km/hr 80 km/hr	Crest 74 33	Sag 42 26
17	Vertical clearance	Road over road Road over railway Electrical lines H.T.Electrical lines Telecommunication Lines	5.5 m 6.525 m 6.0m (Up to 650 V) 6.5m (More than 650 V) 5.5m (Up to 110 V)	

E. Typical Cross Sections

18. The entire length of the project road is proposed on a greenfield alignment and the eccentric two lane cross section is proposed for the first phase in such way that the centre line of the proposed four lane centre line will coincide with the centre line of the right of way. The recommended typical cross sections for straight and super elevated sections are shown in **Figure 5-2 and Figure 5-3.**



TYPICAL CROSS SECTION OF 2-LANE CARRIAGEWAY WITH EARTHERN SHOULDER AT CURVE SECTION



TYPICAL CROSS SECTION OF 2-LANE CARRIAGEWAY WITH EARTHERN SHOULDER AT STRAIGHT SECTION

Figure 5.3 Suggested Typical Cross Sections

F. Implementation Schedule

19. The implementation of the project shall be completed over a period of 18 months (2010-11). The project will be implemented by the Project Implementation Unit (PIU) of the HSRDC. The HSRDC is implementing a number of similar projects and have the institutional capacity to undertake the project. The project involves land acquisition for the entire length and involves utility shifting for the rehabilitation of Gurgaon – Bahadurgarh road section and sections of cross roads included. These are to be carried out prior to commencement of contractors mobilization to avoid delay in project implementation. The project is proposed to be implemented as a single contract package.

III. Description of the Environment

20. Badli in Jhajjhar District, is located at an important junction of roads going to the towns of Delhi, Gurgaon, Jhajjhar, Bahadurgarh, and a number of villages. It is located at 28^{0}34'17.41'' N and 76^{0}48'29.33'' E. The environmental characteristics of Jhajjar district is discussed in the following sections.

A. Physical Environment

1. Terrain

21. The Jajjar district forms part of Indo-Gangatic alluvial plain, with undulating dunes in some parts and small isolated hill in south-western part. It slopes from north-east to south-west, with southern part sloping towards north causing saucer like depression in the flat eastern part. Uneven areas suffer from inundation and water logging during monsoon season. The canal system of the district drains rain water during rainy season.

2. Climate

22. The climate of the project area is sub-tropical, semiarid, continental and monsoon type. Average temperature ranges from 7^{o}C in January to 40.5^{o}C in May and June. January is the coldest month, bringing down the temperature to 3^{o}C; while in summer season it goes up to 47^{o}C. Four seasons of the district are winter from end of November to middle of March, dry summer from April to June, south-west monsoon from July to September and post monsoon season in October and November. Average rainfall of 379 mm in monsoon accounts for 85% of the total rainfall. Air is generally dry in the district; while hot desiccating winds (loo), dust-storms are common in summer. Relative humidity ranges from 95% in monsoon to 15% in summer.

3. Soils

23. The soils of the district are fine to medium textured, comprising of sand to sandy loam of yellowish and brown colour in north-eastern part covering Bahadurgarh and Jhajjar blocks, massive beds of pale reddish brown coloured clay in the southern eastern parts. The organic Carbon, Nitrogen and Phosphorous are low with medium to high Potash. The sandy to sandy loam soil of Sahlawas and Mattanhail Block are light in colour, deficient in organic carbon, low in Nitrogen and Phosphorous with medium to high available potash. Soil parameters observed in the district show pH varying from 7.0 to 7.6 (neutral to slightly alkaline), Electrical conductivity (µS/cm) from 832 to 2,154, Organic Carbon – 0.20% (low) to 0.55% (medium), Nitrogen (kg/ha) – 193 to 688 (low to high), available phosphorus was medium to high, while available potassium was low to medium. The micronutrients copper, zinc, and iron were in the range of 0.32 to 0.43 mg/kg, 0.51 to 0.65 mg/kg, and 4.62 to 5.55 mg/kg, respectively, indicating fertile soil. (Source: ADB EIA 42933-IND-SEIA Jhajjar, Jan. 2009)

4. Geology

24. The area forms a part of in Dugan ethic plain ranging from Pleistocene to recent in age Aeolian deposits of sub-recent age cap the plains. The sediments comprise of clay, sand and Kankar mixed in different proportions. No exposure of hard rock farming the basement is seen in the area. With the exception of few small outliers of Alwar quartzite belonging to the Delhi system, there is nothing of geological interest in the district which is almost entirely covered by alluvium.

5. Land Use

25. Land use in the district is dominated by agriculture, with net area sown at 85.29% of total geographical area. Growth induced by inclusion of the district in the National Capital Region (NCR) is reflected by increase of land use for residential and industrial purposes. Only a negligible area is under forest cover in the project area.

6. Surface Waters

26. There are no waterbodies or wetlands in the area where the bypass is planned. However, due to the large number of brick kins in the area the top soil for a number of farmland has been removed leaving areas which fill up with water after rains. Project road alignment does not cross any river or stream and hence no bridges are required. However cross drainage structures in the form of balancing culverts are required as the alignment generally passing through agricultural fields. A total of 22 culverts are provided in DPR to address the drainage requirements.

7. Groundwater

27. In the district ground water occurs under semi confined to unconfined aquifer conditions. The unconfined aquifers are tapped by dug wells whereas the semi confined aquifers are tapped by shallow tube wells. The groundwater gradient is towards the east. The Hydraulic gradient of ground water is very gentle. Ground water movement in the north-western part is from south-east to north-west; in the south-western part it is from south-west to north-east. Depth of water level in the district varies from 0.98 m to 14.37 m below ground level (bgl) during pre-monsoon period and 1.17 m to 14.37 m bgl during post-monsoon period. About 90% of the area fetches ground water at less than 10 m bgl. Ground water near the water bodies yields fresh water. More than 40% of cropped area is irrigated by tube wells. In Salhawas and Jhajjar blocks ground water is in over exploited category, while Bahadurgarh under critical. Ground water of the district is alkaline in nature with pH ranging from 7.56 to 8.09. Chemical constituents in the ground water are more than the permissible limit, EC (µmho/cm at 25^{o}C) – 1025 to 7520; F (mg/l) – 0.13 to 5.94; Fe – 2.9 mg/l. High chloride content in ground waters of eastern and western parts of the district shows high specific conductivity. The shallow ground water around Kablana in Bahadurgarh block, Kasni Salahwas in Salahwas block is highly mineralized. (Source: Ground water information Booklet, Jhajjar district, Central Ground Water Board, Chandigarh).

8. Ambient Air quality

28. Air quality values for suspended particulate matter (SPM) and respirable particulate matter (RPM) observed in Jhajjar block exceeded the standards for residential, rural, and other areas. High SPM and RPM levels occurred due to strong winds that generated dust storms in summer. Levels of sulfur dioxide (SO_2) and NO_x were well within the permissible standards for residential, rural, and other areas.

Parameter	Observed in Jhajjar in April-June 2007.	Standards
SPM (µg/m^3)	105.0 – 385.0	50 – 100
RPM (µg/m^3)	58.0 – 153.0	--
SO_2	1.0 – 9.3	30 – 120
NO_x	4.0 – 38.0	30 – 120

Source: HPGCL baseline data as collected by MECON Limited for summer season 2007; EIA/EMP Report for 1,320 MW Thermal Power Plant at Jhajjar, Haryana. MECON Limited, 2008.

9. Vegetation

29. The main crops grown in the district during rabi season are wheat, gram, barley, mustard, sarson, sugarcane; and in kharif season are cotten, paddy, jawar, bajra, gawar, arhar, till, groundnut, soya bean, moong. Fruits grown in the district include ber, guava, anola and jamun. All major vegetables,

spice crops like chillies, garlic, an flowers like chrysanthemum, Gladiolus marigold are cultivated in the district.

10. Ecological Resources

30. Bhindawas Bird Sanctuary (notified as protected area in June 2009) in the north-east (15 km from Jhajjar town) and Sultanpur bird sanctuary in the east (55 km from Jhajjar town) are the nearest sensitive sites. There are no environmentally sensitive areas in the vicinity of the Badli town. The trees and shrubs found in the area are those that are found in other parts of the districts, and the characteristics of the vegetation described below.
31. Trees and shrubs noted in the district include shisam (delbergia sisoo), siris (albizzia lebbek), tun (cedrela toona), mulberry (morus), mango (mangifera indca), pipal (ficus religiosa), guler (f. Cunia), bar (f. Indica), lasura (cordial myxa), and shimbal (bombax heptophylla), kikar (acacia arabica), nim (azadirachta indica), jand (prosopis spicigera), nimbar or raunjh (acacia leucopholoea), jamans (zizygium jambolanum), kaindu (diospyrus tomontosa), kaim (stephygone parvifolia), amala (emblica officinalis), rohera (tecoma nudulata), barna (cratoeva religiosa), bel patta (aegle marmelos), amaltas (cassia fistula), dhak (butea frondosa), farash (tamarix orientalis), jhao (tamarix dioica), kharjal (salvadora persica), hingo (balanitos aegyptiaca), hindok, kair (acacia katechu), labul (acacia eburnean), karil (capparis aphylla), jal (pilu), ber or jharpala (zizyphus jujuba), hinsa (capparis horrid), bansa (adhatoda vesica), shimalu (vitex negundo), kanger (pistachio integerrima), mral or marelan (lyceum europaeum), nagpan or prickly pear (cactus indicus), ak (calotropis procera), jawasa (alhagi maurorum), kanda salianasan or yellow-thorned poppy (argemone Mexicana), kandai pasarma (solanum xanthocarpum), dadain (aeschynomene indica), bhuin (anabasis multiflora), khip (orthanthera viminea), kharsana (crotolaria burhia), banna (tamarix gallica) and rerka or bausa (tephrosia purpurea). The grasses are numerous in the district, which include sar (saccharum munja), dub (cynodon dactylon), kans (saccharum spontaneum), gandra or paui or jhuad (anatherum muricatum), makrah, deila, samak (panicum colonum) and bhurat (cenchrum ochinatum).

B. Social and Cultural Resources

1. Demographic profile

32. The total population of Badli was 13,477 according to the 2001 census. Of the total population there were 7506 men and 5971 women. There is no schedule tribe population in Badli, though there is a small population of schedule castes – a total of 1922 persons, 1075 men and 847 women.

33. Total population of Jhajjar district was 880,072 in Census 2001, representing 4.16% of Haryana State. More than seventy five percent of total population lives in rural areas (77.83%) and 22.17% in urban areas (Urbanization of the state-28.9%). Sex-ratio of the district stood at 847 (rural-854, urban-823), when it was 860 for the State. Scheduled castes population is 17.79% (rural-18.32%; urban-15.90%); while no Scheduled Tribe has been notified.

34. Population below 6 years of age in Jhajjar district is 14.97% (rural-15.11%; urban-14.48%), having sex-ratio of 801 (rural-800; urban-804). Total literacy rate (TLR) of the district was 72.37% as against 67.90% of Haryana, in rural areas it was 70.36% (State-63.19%) and in urban 79.42% (State-79.16%). Female literacy rate (FLR) in the district was 59.64% (rural-56.72%; urban-70.10%).

35. Workers participation rate (WPR) of the district was 44.17% of the total population (State-39.62%); it was 47.32% in rural areas (State-42.93%) and 33.10% in urban (State-31.49%). Sex-ratio of the total work force was 588 (rural-683; urban-237), when compared with the State figures of 466 (rural-579; urban-182). Majority of the work force are main workers; 71.06% of the total workers are main

workers (in rural-68.33%; in urban-84.74%). 57.17% of the total workers are engaged in cultivation and agricultural sector; it was 66.61% in rural and 9.77% in urban areas.

2. Industries

36. Agriculture is the major activity in the district. The settlements in the vicinity of Delhi as Badli have seen faster growth of industries, due to proximity of these areas to the cities of Delhi and Gurgaon. Many of the industries in this district are engaged in production of materials used in building and construction sector. A number of economic activities are planned for Badli and the neighbouring areas. These include two number Thermal Power Plants are at Chhuchkawas and one at Badli. Furthermore, this area is also has a number of quarries and stone crushers which provide building material to Delhi and Gurgaon.

IV. Identification of Environmental Impacts and Mitigation Measures

A. Land acquisition and resettlement impacts

37. The proposed bypass is a new formation and involves land acquisition. The first 2.570 km falls under Bahadurgarh Division and the remaining 3.110km falls under Jhajjar Division. Private agricultural land measuring 63.15 acres will be required for the formation of the bypass.

38. The Sec 4(1) notification is yet to be pronounced and the land plan schedule will be prepared only after 4(1) notification. However, the sample surveys carried out in the project area indicate that the project will cause significant impact to 31 households and the impact on another 96 households will be not significant. There are no impacts to indigenous peoples.

39. The acquisition of 63.15 acres of private agricultural land will cause loss of income to the landowners from whom land is proposed to be acquired. The sample socio-economic surveys indicate that the involuntary resettlement impacts are expected to be not significant as the acquisition is linear. Preliminary discussions and consultations have revealed that there are no IP amongst the landowners or among agricultural labourers and hence the project will not require any IPP. However, during the census survey after Sec 4(1) notification and preparation of land plan schedule, if any IP is identified, the project will address the same in line with the Draft ESMS of NCRPB.

40. In line with the Draft ESMS of NCRPB, projects funded by NCRPB will require a resettlement plan and/or an indigenous peoples plan commensurate with the significance2 of impact. Formation of bypass at Badli will come under S-2 category for involuntary resettlement and S-3 category for indigenous peoples as per NCRPB's social categorization.

41. A short resettlement plan has been prepared in line with the Draft ESMS requirements. The summary of resettlement impacts is given in the following table.

Summary of Resettlement Impacts

Impact	Formation of Badli Bypass
Permanent Land Acquisition (ha)	63.15 acres
Temporary Land Acquisition (ha)	0
Affected Households (AHs) – Significant Impact	31 [a]

[2] As per the Draft ESMS projects are categorized based on the significance of involuntary resettlement and impact to indigenous peoples. Involuntary resettlement categories are (a) Category S-1 (Significant Impact): means 200 or more people will experience major impacts, which are defined as (i) being physically displaced from housing, or (ii) losing 10% or more of their productive assets (income generating). Category S-1 projects require a full resettlement plan; (b) Category S-2 (Not Significant). Category S-2 projects include involuntary resettlement impacts that are not deemed significant and require a short resettlement plan; and (c) Involuntary Resettlement Category S-3: There is no involuntary resettlement impacts and hence does not require any action. Indigenous Peoples categories are (a) S-I Significant impacts are those projects that directly or indirectly affect the dignity, human rights, livelihood systems, or culture of indigenous peoples or affect the territories or natural or cultural resources that Indigenous peoples own, use, occupy or claim as their ancestral domain. Category S-1 projects will require a indigenous peoples plan; (b) S-2 Not Significant are projects where the indigenous peoples are the sole or the overwhelming majority of project beneficiaries, and when only positive impacts are identified. Category S-2 projects will require a summary note on IP in project document; and (c) S-3 are projects where no impacts on indigenous peoples are envisaged and hence does not require any action.

Impact	Formation of Badli Bypass
Affected Persons (APs) – Significant Impact	149
Affected Households (AHs) – Not Significant Impact	96[a]
Affected Persons (APs) – Not Significant Impact	461
Titled APs	610
Non-titled APs (Encroachers)	0
Female-headed AH	0
IP/ST-headed AH	0
BPL AH	0
Affected Structures	0
Affected Trees/Crops	0
Affected Common Property Resources	0
Average Family Size	4.8
Average Household Income	Rs.4,800/- p.m.

[a] *Of the 127 households losing their agricultural land, 31 households losing their agricultural land will face significant impact and the impact on the remaining 96 household sis not significant and hey will lose only a strip of their landholding.*

B. Environmental Impacts

42. The assessment for each physical component proposed for this project has been carried out with respect to the potential impacts during the following stages of the project planning and implementation:

- Location impacts. Impacts associated with alignment selection, including impacts on environment and resettlement or livelihood related impacts on communities
- Design impacts. Impacts arising from project design, including the type of designs, design standards etc
- Construction impacts. Impacts resulting from construction activities including site clearance, earthworks, civil works, etc.
- O&M impacts. Impacts associated with the operation and maintenance of the infrastructure built in the project.

43. The potential impacts occurring from this project have been identified below.

1. Location and design impacts

44. Location impacts are not likely to be significant as there are no major environmentally sensitive areas (cultural heritage, protected area or its buffer, wetlands, mangrove, estuaries or any protected area for biodiversity) along or in the vicinity of the proposed alignment. Impacts on water bodies along the project roads have been minimized through careful design of the alignments to avoid encroachment onto the water bodies.

45. The area identified for the construction of the bypass is largely agricultural lands. In addition, there are few brick kilns in the area. Impacts pertaining to loss of agricultural lands have been unavoidable. Similarly, clearance of vegetation and trees along the proposed alignment is required, and will be compensated through compensatory plantation.

2. Construction impacts

46. The impacts during the construction stage shall include impacts associated with road construction activities and can be addressed through adoption of good engineering practices and undertaking specific mitigation measures towards minimization of construction impacts on the sensitive receptors and

communities in the vicinity of the project roads. The mitigation measures for the various impacts are outlined in the Table xx, and are summarized in the following sub-sections.

47. Drainage: Construction activities in the vicinity of natural drainage channels and water bodies, if drainage is not adequately provided, would cause change in the drainage character of the site and lead to water logging.

48. Soil: Construction of road increases the paved surface and permanent loss of top soil under these civil construction works. Excavation for forming the drains and borrowing also involves loss of top soil as well as scarifying the surface with construction machinery and equipment. Spillage of fuel, lubricants, other oils and chemicals will contaminate the soil in the area, especially in the vicinity of productive agricultural lands.

49. Sourcing of materials. While material such as bitumen may be acquired from local hot-mix plants and aggregate from already identified quarries, procurement of soil will still need to be carried out. Considering that the brick kins have already used the top soil in many areas, sites for the procurement of soil may have to be carefully identified.

50. Water Bodies: Stockpiles of construction debris if left unattended near water bodies and low lying areas along the project alignment will be washed off as runoff into the water bodies causing siltation. Spillage of oil, lubricants and other chemicals also mix with the runoff and contaminate the water bodies.

51. Air Pollution: Emission from Construction Vehicles, Equipment and Machinery used for excavation and construction would induce impacts on the air pollution in the construction site as well as on the surrounding settlements. Construction activities generate dust in the surrounding area causing increase in particulate matter. Hot-mix plants installed for road construction will lead to generation of fugitive dust and exhaust emissions. Adequate siting criteria for the hot mix plants to be adopted based on the environmental sensitivity of surrounding land uses.

52. Noise and Vibration Impacts: Generation of noise from construction equipments is a major concern during construction stage. Use of heavy construction machinery in the construction site would generate vibrations and affect the adjacent structures in the settlements. Noise generated during construction is however intermittent and would be of limited duration but would affect the construction workers in case of unprotected prolonged exposure.

53. Material Handling: Storage of Bitumen and other hazardous material if stored near drainage channels would induce hazardous situations to the environment from possibility of leaching into ground and flow as runoff. Spillage of debris and construction material to surface water bodies may lead to surface water quality deterioration. Stockpiling of materials along the edge of the road will obstruct the drainage and restrict the free movement of vehicles.

54. Safety during construction: Appropriate measures during construction shall be worked out to address safety issues during construction. Prolonged exposure of workers to consistently high decibel noise levels above 90 dB(A) also induces hearing losses. Similarly, prolonged exposure of the workers to dusty environment of the construction site induces respiratory problems and loss of man days.

55. Site clearance and Restoration of Construction Camps: Post construction clearance if not adequate, would create unsightly conditions and affect aesthetics of the area. Campsites if not removed usually become a refuge for unscrupulous activities and sometimes develop as another settlement putting strain on the resources. Sanitary pits may cause contamination of surface and ground water.

3. Operational impacts

56. Impacts on environmental conditions associated with the operation stage of the project are identified to be due to increased of traffic and the resultant air and noise pollution from the increased vehicular traffic along the bypass. There are risks of potential land use changes due to the development induced along the bypass, in the absence of any development controls or land use regulations along the bypass.

V. Environmental Management Plan

57. Potential environmental impacts identified in the IEE due to implementation of the project components are to be minimized or avoided through appropriate mitigation and avoidance measures mentioned in Table 5. The agencies that are responsible for implementing the measures that are required to be undertaken have been identified.

Table 1: Environmental Impacts and mitigation measures

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
1	Location Impacts				
1.1	Land acquisition and resettlement impacts required due to widening of roads at certain locations, where required.	Permanent	Major	Given that the alignment is a Greenfield alignment, land acquisition has been unavoidable. Measures to minimize impacts on productive agricultural land have been considered during the selection of alignment.	HSRDC & Design Consultants
2	Design and pre-construction Impacts				
2.1	Alterations of drainage pattern of the site	Permanent	Major	Design of cross drainage structures would be carried out so as to avoid alteration of drainage pattern.	HSRDC, Design Consultants
2.2	Damage to roadside trees	Permanent	Severe	If removal of any tree / vegetation is unavoidable, obtain tree clearance approval from Forest Department. Identify each tree along the proposed route and adequately mark each tree within proposed construction areas. For trees not proposed to be cut, but within the construction area, take all precautions to protect trees not impacted from any damage including placement of tree guards	HSRDC & Design Consultants
2.3	Impact on cultural properties, shrines, temples etc	Permanent	Temporary	The designs shall be worked out to minimize impacts on existing cultural properties, shrines etc. All precautionary measures to address impacts on structures including protection measures required shall be provided in the designs.	HSRDC & Design Consultants
3	Pre-construction Activities by Contractor				
3.1	Construction Camps – Location, Selection, Design and Layout	Temporary	Moderate	The construction camps will be located at least 500m away from habitations at identified sites.	Contractor / Management Consultant
3.2	Drinking water availability and water arrangement	Temporary	Severe	The contractor will be responsible for arrangement of water in every workplace at suitable and easily accessible place for the whole construction period. Sufficient supply of cold potable water (as per IS: 10500) to be provided and maintained. If the drinking water is obtained from an intermittent public water supply then, storage tanks will be provided.	Contractor / Management Consultant
	Establishment of construction camps and / or hot mix plants, if required	Temporary	Moderate	Obtain the consent-to-establish and consent-to-operate from the Pollution Control Board.Adhere to the air pollution and water pollution standards prescribed.	HSRDC, PMC & Contractors
3.3	Identification of disposal sites	Permanent	Major	Location of disposal sites will be finalized based on consultations with the Engineer. The Engineer will certify these are not located within designated environmentally sensitive areas and confirm that: Disposal of the material does not impact natural drainage courses No endangered / rare flora is impacted by such material Settlements are located at least 1000m away from the site	Contractor / Management Consultant
3.4	Quarry Operations	Permanent	Major	It has to be ensured that materials are obtained from licensed quarries having environmental clearance. Quality and legality to be examined by the Contractor and copies of environmental clearances for these needs to be submitted	Contractor / Management Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				prior to sourcing of material.	
3.5	Batching Plants	Temporary	Moderate	Batching plants will be located sufficiently away from habitation, where possible such plants will be located at least 1000m away from the nearest habitation. The contractor will obtain the consent to operate the plants from the SPCB.	Contractor / Management Consultant
4	Construction Impacts				
4.1	Improper stockpiling of construction materials can cause impacts starting from obstruction of drainage, disturbance/ safety hazard to local population, traffic blockage, etc.	Temporary	Moderate	Due consideration will be given for material storage and construction sites and that it does not cause hindrance to the communities. Stockpiles will be covered to protect from dust and erosion.	Contractor / Management Consultant
4.2	Quarry / Borrow pits Operations	Permanent	Moderate	Adequate safety precautions will be ensured during transportation of quarry material from quarries to the construction site. Vehicles transporting the material will be covered to prevent spillage. Operations to be undertaken by the contractor as per the direction and satisfaction of the Engineer.	Contractor / Management Consultant
4.3	Stripping, stocking and preservation of top soil	Permanent	Moderate	The topsoil from borrow areas, areas of cutting and areas to be permanently covered will be stripped to a specified depth of 150mm and stored in stockpiles. The stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and the height of the pile is to be restricted to 2m. Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur. The stockpiles will be covered with gunny bags or tarpaulin. It will be ensured by the contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles. Such stockpiled topsoil will be returned to cover the disturbed area and cut slopes.	Contractor / Management Consultant
4.4	Soil Erosion	Permanent	Moderate	The work will consist of measures as per design, or as directed by the Engineer to control soil erosion, sedimentation and water pollution. All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earthwork or other items of work.	Contractor / Management Consultant
4.5	Compaction of Soil	Temporary	Minor	To minimize soil compaction construction vehicle, machinery and equipment will move or be stationed in designated area (RoW or CoI, haul roads as applicable) only. The haul roads for construction materials will be routed to avoid agricultural areas	Contractor / Management Consultant
4.6	Blasting	Permanent	Moderate	Except as may be provided in the contract or ordered or authorized by the Engineer, the Contractor will not use explosives. Where the use of explosives is so provided or ordered or authorized, the Contractor will comply with the requirements of the following Sub-Clauses of MoRTH 302 besides the law of the land as applicable. The Contractor will at all times take every possible precaution and will comply with appropriate laws and regulations relating to the importation, handling, transportation, storage and use of explosives and will, at all times when engaged in blasting operations, post sufficient warning flagmen, to the full satisfaction of the Engineer. The Contractor will at all times make full liaison with and inform well in advance and obtain such permission as is	Contractor / Management Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				required from all Government Authorities, public bodies and private parties whomsoever concerned or affected or likely to be concerned or affected by blasting operations. Blasting will be carried out only with permission of the Engineer. All the statutory laws, regulations, rules etc., pertaining to acquisition, transport, storage, handling and use of explosives will be strictly followed.	
4.8	Loss of Access	Temporary	Moderate	Construction activities that will affect the use of side roads and existing access to individual properties will not be undertaken without providing adequate access. The construction works will not interfere with the convenience of the public or the access to, use and occupation of public or private roads, or any other access to properties, whether public or private.	Contractor / Management Consultant
4.9	Soil and Water Pollution due to fuel and lubricants, construction waste	Temporary	Moderate	The fuel storage and vehicle cleaning area will be stationed such that runoff from the site does not drain into the water body. Oil interceptor will be provided at construction vehicle parking area, vehicle repair area and workshops ensuring that all wastewater flows into the interceptor prior to its discharge.	Contractor / Management Consultant
4.10	Siltation of Rivers and streams due to spillage of construction wastes	Temporary	Moderate	Silt fencing to be provided at all water bodies near construction sites to prevent sediments from the construction site to enter into the watercourses. The number of units of silt fencing to be installed is to be decided by the engineer. Discharge standards promulgated under the Environmental Protection Act, 1986 for surface water bodies will be strictly adhered to. No disposal of construction wastes will be carried out into the river.	Contractor / Management Consultant
4.11	Generation of Dust	Temporary	Moderate	The contractor will take every precaution to reduce the levels of dust at construction sites to the satisfaction of the Engineer. All earthwork to be protected/covered in a manner acceptable to the satisfaction of the engineer to minimise dust generation.	Contractor / Management Consultant
4.12	Emissions from batching plants	Temporary	Moderate	Batching plants will be located atleast 500m away from environmentally sensitive areas as Reserved Forests / National Parks and sensitive receptors i.e., hospital and college. The exhaust gases will comply with the requirements of the relevant current emission control legislation. All operations at plants will be undertaken in accordance with all current rules and regulations protecting the environment. Monitoring of air and noise parameters will be as per monitoring plan	Contractor / Management Consultant
4.13	Emission from Construction Vehicles, Equipment and Machinery	Temporary	Moderate	The discharge standards promulgated under the Environmental Protection Act, 1986 will be strictly adhered to. All vehicles, equipment and machinery used for construction will conform to the relevant Bureau of Indian Standard (BIS) norms. All vehicles, equipments and machinery used for construction will be regularly maintained to ensure that pollution emission levels comply with the relevant requirements of SPCB and the Engineer. 'PUC' certificates will be obtained regularly for all vehicles used for the project. Copies will be submitted regularly to the Engineer.	Contractor / Management Consultant
4.14	Dust Pollution from Crushers	Temporary	Minor	All crushers will obtain siting clearance from SPCB or only those crushers that have already have obtained license from SPCB will be used.	Contractor / Management Consultant
4.15	Noise from construction Equipments	Temporary	Moderate	Maintenance of vehicles, equipment and machinery will be regular and to the satisfaction of the Engineer, to keep noise from these at a minimum.	Contractor / Management Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				All vehicles and equipment used for construction will be fitted with exhaust silencers. During routine servicing operations, the effectiveness of exhaust silencers will be checked and if found to be defective will be replaced. Noise limits for construction equipment used in this project (measured at one metre from the edge of the equipment in free field) such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws will not exceed 75 dB (A), as specified in the Environment (Protection) Rules, 1986 Notwithstanding any other conditions of contract, noise level from any item of plant(s) must comply with the relevant legislation for levels of noise emission.	
4.16	Traffic Control and Safety	Temporary	Moderate	Before taking up any construction, detailed Traffic Control Plans will be prepared and submitted to the Engineer for approval, 5 days prior to commencement of work on any section of road. The traffic control plans shall contain details of arrangements for construction under traffic and details of traffic arrangement after cessation of work each day.	Contractor / Management Consultant
4.17	Road furniture	Temporary	Minor	All roadside structures / furniture, protection, intersections, traffic islands, rotaries, facilities and amenities etc. will be constructed as per engineering design and to the satisfaction of the engineer.	Contractor / Management Consultant
4.18	Material Handling at Site	Temporary	Minor	All workers employed on mixing asphaltic material, cement, concrete etc., will be provided with protective footwear and protective goggles. Workers, who are engaged in welding works, would be provided with welder's protective eye-shields. Workers engaged in stone breaking activities will be provided with protective goggles and clothing and will be seated at sufficiently safe intervals. The use of any toxic chemical will be strictly in accordance with the manufacturer's instructions.	Contractor / Management Consultant
4.19	Disposal of Bituminous wastes / Construction Waste / Debris / Cut Material	Temporary	Moderate	The bituminous waste generated will be reused in road construction based on its suitability of reuse to the maximum extent possible. Safe disposal of the extraneous material will be ensured in the pre-identified disposal locations. In no case, any construction waste will be disposed around the project road indiscriminately. Cut material generated because of construction will be utilized for as filling material. Remaining material if any will be disposed off safely at the disposal sites.	Contractor / Management Consultant
4.20	Safety Measures During Construction	Temporary	Moderate	All relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996 will be adhered to. Adequate safety measures for workers during handling of materials at site will be taken up. The contractor has to comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress. The Personal Protective Equipment for workers on the project will conform to respective IS codes.	Contractor / Management Consultant
4.21	Risk caused by Force Majure	Temporary	Minor	All reasonable precaution will be taken to prevent danger of the workers and the public from fire, flood, drowning, etc. All necessary steps will be taken for prompt first aid treatment of all injuries likely to be sustained during the course of work.	Contractor / Management Consultant
4.22	Malaria Risk	Temporary	Minor	The Contractor will, at his own expense, conform to all anti-malaria instructions given to him by the Engineer.	Contractor / Management

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
					Consultant
4.23	First Aid	Temporary	Minor	At every workplace, a readily available first aid unit including an adequate supply of sterilized dressing material and appliances will be provided as per the Factory Rules. Suitable transport will be provided to facilitate transfer of injured or ill person(s) to the nearest hospital. At every workplace and construction camp, equipment and nursing staff will be provided.	Contractor / Management Consultant
4.24	Hygiene	Temporary	Minor	All latrines will be provided with dry-earth system (receptacles), which will be cleaned at least four times daily and at least twice during working hours and kept in a strict sanitary condition. Receptacles will be tarred inside and outside at least once a year. All temporary accommodation must be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing. Garbage bins must be provided in the camps and regularly emptied and the garbage disposed off in a hygienic manner. Adequate health care is to be provided for the work force. Unless otherwise arranged for by the local sanitary authority, the local medical health or municipal authorities will make arrangement for disposal of excreta. On completion of the works, all such temporary structures will be cleared away, all rubbish burnt, excreta tank and other disposal pits or trenches filled in and effectively sealed off and the outline site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the engineer.	Contractor / Management Consultant
4.25	Archaeological Property chance find	Temporary	Minor	The contractor will take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing and will, immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out the Engineer's instructions for dealing with the same, awaiting which all work will be stopped 100 m all directions from the site of discovery. The Engineer will seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence work on the site.	Contractor / Management Consultant
4.26	Clearing of Construction Camps & Restoration of	Temporary	Major	Contractor to prepare site restoration plans for approval by the Engineer. The plan is to be implemented by the contractor prior to demobilization. On completion of the works, all temporary structures will be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the Engineer.	Contractor / Management Consultant
5	O&M Impacts				
5.1	Environmental Conditions	Permanent	Moderate	The HSRDC will undertake seasonal monitoring of air, water, noise and soil quality through an approved monitoring agency. The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored will be as per the Monitoring Plan prepared.	HSRDC
	Survival of trees planted	Permanent	Moderate	Proper care shall be taken to increase survival rate of saplings like regular watering, pruning, provision of tree guards, manure for better nourishment, etc. including timely replacement of perished saplings.	HSRDC
	Induced development impacts	Permanent	Major	To address issues of induced development along the bypass, appropriate land use plans and regulations to ensure that growth along the bypass is in orderly. Local government	

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				bodies and development authorities will be encouraged to control building development along the bypass.	
5.2	Increased air and noise pollution due to increased traffic using the improved roads	Permanent	Moderate	Smooth and better road surface will reduce generation of noise. Provision of vegetative barriers where ever possible. Other measures such as improved transport fuel quality, more stringent environmental norms, installation of no horn signages at educational institutes and at hospitals	HSRDC
5.3	Drainage of roadsides	Permanent	Moderate	To ensure efficient flow of surface water and to prevent water logging along the side of the roads adequate size and number of cross-drainage structures and longitudinal drains are provided in the design. These will be adequately maintained by cleaning and avoiding clogging of openings.	HSRDC
5.4	Traffic and Accident Safety	Permanent Risk	Major	Depending on the level of Congestion and traffic hazards, traffic management plans will be prepared. Traffic control measures including speed limits to be enforced strictly. Road control width to be enforced.	HSRDC

VI. Institutional Requirements

A. Institutional Arrangements

58. Haryana State Roads Development Corporation (HSRDC), as the Implementing Agency (IA) will undertake all actions for the implementation of the project. HSRDC will have one specialist identified to overseeing the implementation of the EMP, and will be outsourced. An Environmental Officer (consultant) shall be inducted within the HSRDC to address the environmental impacts due to the project. The identified officer should be a Civil Engineer specializing in Environment or a related field with experience in the management of infrastructure projects. S/he should be similar with Indian legislation and the implementation of multi/bilateral loan projects.

59. Roles and Responsibilities

- Review of IEE and other environment documents based upon ADB's Environmental Assessment Guidelines, or other multilateral or bilateral agency guidelines, as required.
- Liaise and obtain clearances from with required state and central departments for clearances and compliance to regulations.
- Monitor and oversee the implementation of the Environmental Management Plan
- Ensure inclusion of EMP in contractor's ToRs.
- Oversee implementation and monitor compliance to the EMP
- Undertaken required interactions with civil society groups and community for projects under implementation
- Ensure inclusion of public concerns and grievances in EMP and project implementation. Undertake dialogue with affected communities, as required.
- Review environmental performance of project through periodical environmental monitoring reviews. Where additional environmental safeguards are identified incorporate them in project design, construction or implementation or other follow-up actions, as required.
- Provide required support for the management of environmental concerns in the implementation of the project
- Develop, review and plan and implement training and capacity building for contractors and consultants involved in the project

60. A consultant shall be hired for supervising construction activities. This agency will need an officer identified for overseeing the implementation of the EMP. The roles and responsibilities of this individual will be,

- Work closely with Corporation's environmental specialist for the implementation of EMP and ensure compliance to environmental safeguards, support its implementation
- Work with Corporation's environmental specialist for getting environmental clearances for the project
- Review of EMP implementation and advice the Corporation's environmental specialist on the implementation status
- Review any changes in project design, identify environmental safeguards if required and work with the Corporation's environmental specialist to reflect identified safeguards in EMP
- Ensure all identified systems – safety, accident management and control, waste are in place, functioning and implementing personnel have adequate training to implement actions
- Consultation with stakeholders and inclusion of their concerns in project implementation
- Incorporate environmental safeguards as required during project implementation.

B. Environmental Monitoring Plan

61. Prior to developing a monitoring plan there is a need for the development of a baseline for some activities. This would help with the monitoring activities. The baseline is described below.

1. Development of a baseline

62. Prior to developing a monitoring plan there is a need for the development of a baseline for some activities. This would help with the monitoring activities. The baseline is described below.

Sl. No.	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Responsibility	Cost estimates INR
1	Air Quality	Pre construction	SPM and RSPM, NOx, CO	Two on the bypass, alignment,	Once	DPR consultant	4000/sample
2	Noise	Pre construction	Decibels	Two on the bypass, Badli alignment	Once	DPR consultants	1000/sample
3	Water quality	Pre construction	Surface water quality	Sample waterbodies along with construction activities will be undertaken	Once, prior to construction	DPR consultants	2000/ sample
4	Site for quarries and borrow pits	Pre construction	The site situation – for rehabilitation, photographs	All sites identified for quarries, borrow pits, waste and construction labour camps and offices	Once prior to construction	DPR consultants/ agency identified to supervise construction	30,000 lump sum
5	Vegetation removal	Pre construction	Vegetative survey to identify type and amount of vegetation that requires to be replaced	Along paths that are to be cleared off trees for construction activities	Once prior to construction	DPR consultants	300000 lump sum

2. Monitoring Actions

Sl. No.	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Responsibility	Cost estimates INR
1	Air Quality	Construction	SPM and RSPM, NOx, CO	Ten – two on each of the roads – for all 5 roads, near habitations.	Thrice annually	Contractor	4000/sample
2	Noise	Construction	Decibels	Ten – two on each of the roads – for all 5 roads, near habitations.	Thrice annually	Contractor	1000/sample
3	Water quality	Construction	Surface water quality	Sample waterbodies along with construction activities will be undertaken	Thrice annually	Contractor	2000/sample
4	Site for quarries and borrow pits	Construction	After construction activity over – if rehabilitated	All quarries, borrow pits, waste and construction labour camps and offices sites	Once prior to construction	Contractor	40,000 total
5	Tree/vegetation plantation	Construction	Ensure all vegetation/tree replacement activity undertaken	Based upon discussions with local community and Forest Department	During construction	Contractor	40,000 total
6	Air Quality at Residential area	Operation	RPM, SPM, SO_2, NO_x, CO and Hydrocarbons	At ten locations, especially around sensitive receptors and settlements	Once in a season (except monsoons) for the first 3 years of operation	Contractor	100000 per year
7	Noise Levels at residential and silence zone	Operation	Equivalent Day & Night Time Noise Levels	At ten locations, especially around sensitive receptors and settlements	Once in a season for the first 3 years of operation	Contractor	50000 per year

C. Training & Capacity Building

63. The training programme will start with a Sensitization Workshop for officials of HSRDC and also the Contractor's personnel. Typical modules that would be present for the training session would be as follows:

- Sensitization
- Introduction to Environment Considerations in Urban Development Projects
- Review of IEE and Integration into Design
- Improved Co-ordination within Nodal Departments, on special issues, if any.
- Role during construction
- Monitoring & Reporting System

64. The proposed training program along with the frequency of sessions is presented in the table below.

Program	Description	Participants	Form of Training	Duration	Trainer / Agency
Introduction and sensitisation to environment issues	Sensitisation on environmental concerns ▪ Environmental impacts of road's projects ▪ GoI environmental regulations ▪ ADB/multilateral/bilateral environmental regulations ▪ Coordination between departments for implementation of environmental safeguards	Senior department engineers HSRDC officials responsible for implementing project and office in-charge of implementing environmental safeguards	Workshop	Half day workshop	External Consultants/ NCRPB
EMP implementation	Implementation of environment EMP ▪ Identification of environment impacts ▪ Monitoring and reporting for EMP ▪ Public interactions and consultations ▪ Identification of various government	Department head at Haryana PWD B&R and HSRDC in-charge of the project, officer in-chare of project implementation, identified officer in-charge of implementing EMP	Lectures and field visit		External Consultants/ NCRPB
EMP implementation	Implementation of EMP ▪ Identification of environment impacts ▪ Monitoring and reporting for EMP ▪ Public interactions and consultations	Officer in charge of implementing this project activities at HSRDC, officer implementing EMP for agency/contractors	Lecture and field visit	One day session	External Consultants/ NCRPB
Implementation of EMP	Reporting and coordination ▪ Coordination for consents and with various departments ▪ Identification of environmental impacts ▪ Monitoring formats filling and review of impacts	Officer in charge of implementing this project activities, officer implementing EMP for agency	Lecture and interactive session	Half day session	External Consultants/ NCRPB
Recurring training programmes	Management of Environmental impacts Identification of Environmental impacts Environmental regulations	Department head at Haryana PWD B&R and HSRDC in-charge of the project, officer in-chare of project implementation, identified officer in-charge of implementing EMP	Lecture and interactive session	One day session	External Consultants/ NCRPB

Program	Description	Participants	Form of Training	Duration	Trainer / Agency
	Environmental monitoring and review				

D. Environmental Budget

65. As part of good engineering practices in the project, there have been several measures as erosion prevention, rehabilitation of borrow areas, safety, signage, provision of temporary drains, etc the costs for which will be included in the design costs. Therefore, these items of costs have not been included in the IEE budget. Only those items not covered under budgets for construction and RP are costed in the IEE budget. The IEE costs include mitigation, monitoring and capacity building costs. The summary budget for the environmental management costs for the project is presented in the following table.

Sl. No.	Particulars	Stages	Unit	Total number	Rate (INR)	Cost (INR)
A.	Mitigation Measures					
1	Management of dust and sand during construction activities – suppression etc	Construction	Lump sum			100,000.00
2	Ensuring occupational safety for workers at camps and construction sites	Construction	Lump sum			200,000.00
	Sub -Total (A)					300,000
B.	Monitoring Measures					
	Water quality	Pre-Construction / Construction	Per sample	8	4000	36,000
	Air	Pre-Construction / Construction	Per sample	18	2000	36,000
	Noise	Pre-Construction / Construction	Per sample	18	1000	18,000
	Burrow pits sites etc	Pre-Construction / Construction	Lump sum			30,000
	Vegetation/tree survey and monitoring implementation of tree plantation	Pre-construction / construction	Lump sum			30,000
	Sub -Total (B)					150,000
C	Capacity Building					
2	Sensitisation, awareness	Pre-construction	Lump sum			472000
3	Monitoring and management	Construction	Lump sum			187000
	Sub-Total (C)					659000
	Total (A+B+C), INR					1318000

VII. Public Consultation and Information Disclosure

A. Process of Consultation Followed

During the preparation of the project, consultations with stakeholders were held on environmental issues with HSRDC, communities along the project roads and affected persons. Consulted stakeholders include – users, village elected members at Badli, residents of Badli and farmers whose land is to be acquired. Apart from discussions with people in the village, a transact walk on part of the way identified for the construction of the bypass was taken where discussions with farmers – land owners and share croppers was taken and a visit was made to the take off point for the bypass where vehicles stopped and discussions with users were undertaken. The general impression from the consultations was that all stakeholders were glad for the development as it would result in a better environment in the area, ease traffic and reduce travel time, and will also result in fewer accidents. Summary of the consultations undertaken is given in Table below.

Table 2: Summary of Consultations

S.No.	Place	Date	Number of participants	Participants	Issues discussed
1	Badli agriculture fields	6 November, 2009	1	Share cropper	The development is positive as it will reduce traffic jams and inconvenience in the village No loss of livelihood perceived as can take up other areas for cultivation
2	Agricultural fields in Badli area	6 November, 2009	2	Land owners	Happy about the construction activity as profits from agriculture is low since irrigation water is limited – tubewells with water tables are at 70 ft depths and dropping and water is saline Loss of crop in bad rain years is the norm There will be some loss of land, but will gain better road conditions and safety in village as accidents will reduce Too much dust in the town due to the excessive through traffic passing A farmer plans to open an eatery on his remaining land once the bypass is constructed Trust in the government giving money on time There is expected to be no major inconvenience caused by the construction A farmer suggested that there should be no construction up to 30 meters from the road as it obstructs traffic and entry to the bypass should be restricted to a few points to ensure smooth flow of traffic
3	Present road and take off point	6 November, 2009	3	Users	The bypass will also ensure that they have a shorter route and there is too much congestion and waste of time in congestions in the town The present route also increases risks of accidents and therefore an alternate route should be considered Would like some facilities like tyre puncture repair shops and eateries on the bypass so that there is no need to go to Badli
4	Bhadurgarh	6 November, 2009	1	PWD B&R	The demand for a bypass has been there for a long time as the present road results in traffic jams in the village However, the present road was a bypass

S.No.	Place	Date	Number of participants	Participants	Issues discussed
					but people constructed along side the road which has resulted in the need for another bypass. Unless this can be prevented for the planned bypass, in a while the situation of the present bypass will also occur for the planned one There is a lot of development planned for the area like the medical and educational centres, brick kins, crushers and hot-mix plants are there in the area. Therefore, traffic can be very heavy on the present road Risk of accidents in the town are high due to the heavy traffic
5	Badli	6 November, 2009	2	Elected representatives	Dust, noise and pollution from the present road is a major concern and therefore there has been a demand for the bypass Sometimes congestion in the village is so bad that roads are blocked for over an hour, especially as the local market is situated on the road Accidents on the road are a major concern – children are at the highest risk
6	Badli	6 November, 2009	1	Resident	Dust, noise and pollution are major problems from the traffic on the present road There is always a threat of accidents due to the heavy traffic and alternate routes need to be identified to divert the traffic from the area

B. Framework for continued public participation

66. A grievance redressal cell will be set up within the HSRDC to register grievances of the people regarding technical, social and environmental aspects. This participatory process will ensure that all views of the people are adequately reviewed and suitably incorporated in the design and implementation process. Further, to ensure an effective disclosure of the project proposals to the stakeholders and the communities in the vicinity of the project locations, an extensive project awareness campaigns will be carried out.

67. For the benefit of the community the Summary IEE will be translated in the local language and made available at: (i) Office of the HSRDC Division at Jhajjar, (ii) Office of the District Commissioner Jhajjar districts. These copies will be made available free of cost to any person seeking information on the same. Hard copies of the IEE will be available in the HSRDC office as well as the local library at Badli, and accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. On demand, the person seeking information can obtain a hard copy of the complete IEE document at the cost of photocopy from the office of the Divisional office of the HSRDC at Jhajjar, on a written request and payment for the same. Electronic version of the IEE will be placed in the official website of the HSRDC and the website of ADB after approval of the documents by Government and ADB. The HSRDC will issue notification on the disclosure mechanism in local newspapers, ahead of the initiation of implementation of the project, providing information on the project, as well as the start dates etc. The notice will be issued in local newspapers one month ahead of the implementation works. This will create awareness of the project implementation among the public. Posters designed to mass campaign the basic tenets of the IEE will be distributed to libraries in different localities that will be generating mass awareness.

VIII. Findings and Recommendations

68. It is to be noted that as per the statutory requirements of Government of India (Environmental Impact Assessment Notification, September 2006, and its subsequent amendment 2009) Environmental Impact Assessments are not required for the proposed road improvements. The proposed development does not fall either in Category A or in Category B as per GoI EIA requirements. The significance of the environmental impacts will be more due to the construction related impacts than any impacts associated with areas of rich environmental sensitivity. It is to be noted that the resultant potential impacts from these proposals can be offset through provision of proven mitigation measures during the design and adoption of good engineering practices during construction and implementation. EMP prepared to this affect addresses these potential impacts through appropriate mitigation, management and monitoring measures.

69. The effective implementation of the measures proposed will be ensured through the building up of capacity towards environmental management within the HSRDC supplemented with the technical expertise of an Environmental Specialist as part of the Management Consultants. Further, the environmental monitoring plans prepared as part of the EMP will provide adequate opportunities towards course correction to address any residual impacts during construction or operation stages.

IX. Conclusions

70. The project will have a number of benefits such as – reduced congestion on the existing road through the Badli town, and thereby savings of time, reduced accidents and smoother flow of traffic, and improved air quality / noise levels within the town. The impacts associated with induced development along the bypass shall be addressed through appropriate development controls and land use regulations during the operation of the bypass. The proposed components should proceed through to design and implementation, subject to mitigation measures and monitoring programs as per EMP for potential impacts identified in the IEE. These will be updated and detailed during detailed design stage, and based on above recommendations. It may be emphasized that the present IEE, which identifies potential impacts and EMP which presents appropriate mitigation measures, is sufficient enough to safeguard the environment. There are no significant adverse impacts, which are irreversible or may lead to considerable loss/destruction of environment, envisaged. All the impacts are generic and have proven mitigation measures to minimize/mitigate the same.

X. Appendix 1: REA Checklist

ROADS AND HIGHWAYS

Instructions:

- This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
- Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: Jhajjar Roads, Haryana. NCRPB, India

Sector Division:

SCREENING QUESTIONS	Yes	No	REMARKS
A. PROJECT SITING IS THE PROJECT AREA ADJACENT TO OR WITHIN ANY OF THE FOLLOWING ENVIRONMENTALLY SENSITIVE AREAS?			There are no special or protected areas.
▪ CULTURAL HERITAGE SITE	☐	■	
▪ PROTECTED AREA	☐	■	

SCREENING QUESTIONS	Yes	No	REMARKS
▪ WETLAND	☐	■	
▪ MANGROVE	☐	■	
▪ ESTUARINE	☐	■	
▪ BUFFER ZONE OF PROTECTED AREA	☐	■	
▪ SPECIAL AREA FOR PROTECTING BIODIVERSITY	☐	■	
B. POTENTIAL ENVIRONMENTAL IMPACTS WILL THE PROJECT CAUSE…			
▪ encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries?	☐	■	
▪ encroachment on precious ecology (e.g. sensitive or protected areas)?	☐	■	
▪ alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?	■	☐	The topography of the area is relatively flat. However, surface runoff during rains could lead to stagnating water in the fields adjoining the roads. The project design therefore needs to include culvets and road side drainage.
▪ deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	■	☐	Concerns may exist as there will be a need to get labour from outside, therefore requiring labour camps.
▪ increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?	■	☐	This would occur, however as it is planned to procure all material from the
▪ noise and vibration due to blasting and other civil works? ▪ dislocation or involuntary resettlement of people	■	☐	A new road is to be made increasing noise and vibrations. However, disturbance will be limited considering that there are no settlements in the area.
▪ other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress?	■	☐	There is a need for relocation as agriculture land is to be acquired for the project.
▪ hazardous driving conditions where construction interferes with pre-existing roads?	☐	■	

SCREENING QUESTIONS	Yes	No	REMARKS
▪ poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?	■	☐	Local population do not work as construction labour, therefore workers from outside will be specially brought for the construction of the road, requiring labour camps and associated amenities.
▪ creation of temporary breeding habitats for mosquito vectors of disease?	■	☐	At labour camps, quarries and borrow pits the possibility of temporary breeding habitats for mosquito vectors is possible.
▪ dislocation and compulsory resettlement of people living in right-of-way?	☐	■	There is nobody living in right of way. The identified land is mainly for agricultural
▪ accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials and loss of life?	☐	■	
▪ increased noise and air pollution resulting from traffic volume?	☐	■	
▪ increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?	☐	■	

Environmental Assessment Document

E.CONSTRUCTION OF VARIOUS ROADS IN SONEPAT DISTRICT

The Environmental Assessment is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

Table of Contents

I. INTRODUCTION

A. Background

1. The Project aims to promote growth and balanced development of the whole National Capital Region through providing economic base in the identified major settlements (Metro Centres/Regional Centres) for absorbing economic development impulse of Delhi, efficient transport network, development of physical infrastructure, rational land use pattern, improved environment and quality of life. In line with the objectives of the Regional Plan, the primary objective of this project are to improve quality of life and well-being of urban residents in the National Capital Region (NCR): This will be achieved by way of support to various agencies in the constituent States through NCRPB a line of credit to compliment the ongoing efforts of NCRPB in financing the regional Plan priorities and technical assistance to improve quality of planning, design and management interventions in the region. To address the twin business propositions of the National Capital Region Planning Board (NCRPB), – planner of relevance and a strategic financier, - the ADB line of credit comprises of both an investment loan USD 140 million and a TA component of USD 10 million. The projects to be taken up are typical of regions needs –small town water and sanitation, connectivity investments and transport infrastructure which provides multi modal transport linkages.
2. This Initial Environmental Examination (IEE) assesses the environmental impacts due to the proposed improvements to the following roads in Sonipat and Jajjar districts in Haryana:

- Gohana-Sisana Road (28.563 km)
- Sonepat-Mehlana-Farmana Road, (21.883 km)
- Sonepat-Kakroi-Bidhlan Road VT, (19.635 km)
- Jagsi-Gangana Road VT, (6.177 km), and,
- Kharkhauda-Assaudha Road, (18.045 km).

3. The IEE specifies measures towards addressal of the impacts. The IEE has been prepared based on a review of sub-project designs; field visits, and secondary data to characterize the environment and identify potential impacts; and consultations with stakeholders. An Environmental management plan (EMP) outlining the specific environmental measures to be adhered to during implementation of the sub-project has been prepared.

B. Compliance to ESMS of NCRPB

4. Recognizing the environmental and social issues that can arise in infrastructure projects, NCRPB has prepared a Draft Environmental and Social Management Systems (ESMS) in line with ADBs safeguard requirements for Financial Intermediaries (FIs). The ESMS provides an overall management system to NCRPB to identify, assess, and mitigate environmental and social issues that are likely to arise in projects financed by NCRPB and implemented by Implementing Agencies (IAs). The ESMS outlines the policies, methods of assessments and procedures that will enable NCRPB to ensure that a project that it funds is developed in accordance with ESMS and is adequately protected from associated risks. IAs will have to comply with the ESMS conditions while submitting their loan application. This IEE has been prepared in line with the ESMS of NCRPB.

C. Purpose of the IEE

5. The proposed components will result in positive environmental impacts. The alignments are proposed along the existing routes and widening /strengthening is envisaged within the available RoW. In case of stretches within settlements, resettlement impacts have been avoided through design of constricted cross-sections and provision of appropriate traffic management measures.

Design of the alignment adopting this approach has enabled avoidance of impacts related to land acquisition, and impacts on agriculture lands, with the exception of the Sonepat – Kakori – Bidhlan road, wherein land acquisition of xx ha has been necessitated due to need for improvement of geometrics at critical locations.

6. Given the magnitude of civil works, there would be typical construction related impacts, and could be mitigated by appropriate mitigation measures and adoption of good construction practices. Further, these will be of limited intensity and of short duration. None of the project interventions as part of these proposed road improvements are proposed within locations in or near sensitive and valuable ecosystems, including protected areas and forests. Therefore, as per the ESMS, the sub-projects are categorized as 'B' and an IEE carried out. This IEE provides mitigation measures for impacts related to construction, operation, and maintenance.

D. Environmental Regulatory Compliance

7. The realm of environmental regulations and mandatory requirements for the proposed sub-project is shown in Table 1.The Environmental Impact Assessment (EIA) notification, 2006 by the Ministry of Environment and Forests (MoEF, GoI) specifies the mandatory environmental clearance requirements. Accordingly, all projects and activities are broadly categorized in to two categories - Category A and Category B, based on the spatial extent of potential impacts and potential impacts on human health and natural and man-made resources. This project does not require any environmental clearances under the Environmental Protection Act 1986. However, the project will require consent from Competent Authorities such as the Haryana State Pollution Control Board.

Sub-Component	Applicability of Acts/Guidelines	Compliance Criteria
Roads and highways	Environmental (Protection) Act, 1986 (and as amended subsequently in 2006), and in 2009 The EIA notification, 2006 categorization of projects into category A and B, based on extent of impacts. All new state highway projects and state highway expansion projects in hilly terrain or in ecologically sensitive areas are categorized as category B projects.	According to the notification, the project roads do not fall under either category A or Category B. The roads included are district roads and are not state highways. Therefore, environment clearance is not required for the project. However, permission for felling of road side trees will be required. Consent for Establishment and Consent for Operation from the State Pollution Control Board will be required.

8. The ADB guidelines, stipulate addressing environmental concerns, if any, of a proposed activity in the initial stages of Project preparation. For this, the ADB Guidelines categorizes the proposed components into categories (A, B or C) to determine the level of environmental assessment[1] required to address the potential impacts. None of the project interventions are proposed within locations in or near sensitive and valuable ecosystems, including protected areas and forests. The sub-project has been categorized as B. Accordingly this IEE is prepared to address the potential impacts, in line with the recommended IEE content and structure for Category B projects. The IEE was based mainly on secondary sources of information and field reconnaissance surveys. Stakeholder consultation was an integral part of the IEE.

[1] Level of environmental assessment required for each category of Project, as per ADB's Safeguards Policy Statement, 2009 and Environmental Assessment Guidelines 2003 is as follows: (i) Category A. Sub-project components with potential for significant adverse environmental impacts. An environmental impact assessment (EIA) is required to address significant impacts; (ii) Category B. Sub-project components judged to have some adverse environmental impacts, but of lesser degree and/or significance than those for Category A projects. An initial environmental examination (IEE) is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report. (iii) Category C. Sub-components unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are still reviewed.

E. Report Structure

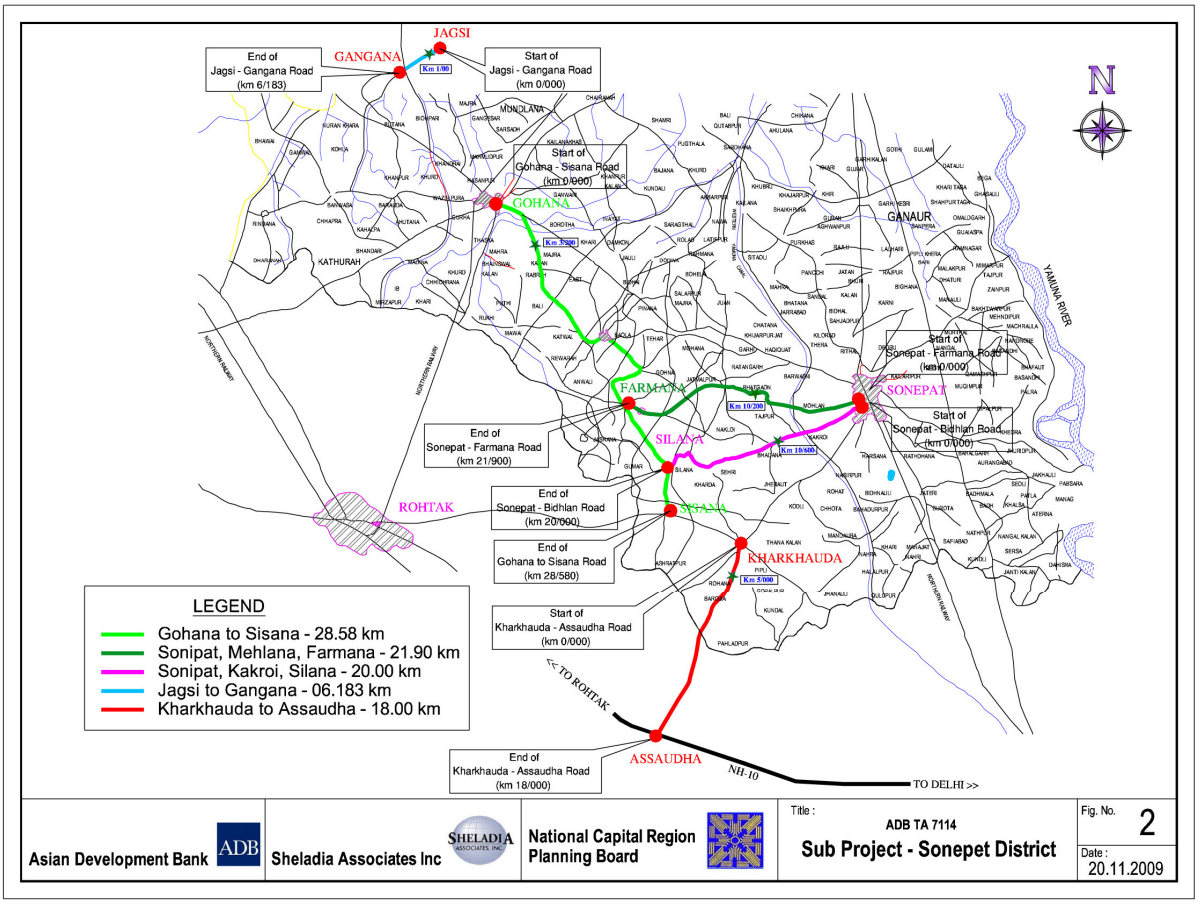
9. This Report contains 8 sections including this introductory section: (i) introduction; (ii) description of project components; (iii) description of the environment; (iv) environmental impacts and mitigation measures; (v) institutional requirements; (vi) public consultation and information disclosure; (vii) finding and recommendation; and (viii) conclusions. An Environmental management plan (EMP) outlining the specific environmental measures to be adhered to during implementation of the sub-project has been prepared.

II. DESCRIPTION OF PROJECT COMPONENTS

A. Project Description

10. The five roads proposed for rehabilitation and widening is shown in table below. Location map of the project roads is provided in the Figure below.

S.No.	Name of the Road	District	Length(km)
1	Gohana-Sisana Road	Sonepat	28.563
2	Sonepat-Mehlana-Farmana Road	Sonepat	21.883
3	Sonepat-Kakroi-Bidhlan Road VT	Sonepat	19.635
4	Jagsi-Gangana Road VT	Sonepat	6.177
5	Kharkhauda-Assaudha Road	Sonepat and Jhajjar	18.045



11. The project roads consists of five separate roads having carriageway width varying from 3.5m to 5.5m and with 1m to 1.5 wide earthen shoulders on both sides. The design service volume (DSV) of single lane carriage way is 2000PCU and the current traffic in almost all the project roads exceeds the DSV. This indicates the immediate requirement of capacity augmentation in form of widening to 2 lane carriageway. Sections of the roads pass through a few built-up areas with inadequate road geometry. Between the built-up areas, alignment is fairly straight. The project road

passes through plain terrain with mild gradients. The present condition of the pavement is very poor and the existing bituminous layer has no residual strength and hence scarification of existing pavement and reconstruction from the base or sub base level is required. The improvement proposal is generally restricted within the available ROW. Six out of 20 minor bridges in the project road are proposed for replacement. 115 culverts are provided as part of the project improvement which includes 20 new culverts, reconstruction of 36 culverts and widening of 10 culverts.

12. The five roads selected for improvements are linking various villages to the main transport network consisting of National Highways and State Highways. In addition to the requirement for widening, the conditions of the existing road are very poor and needs rehabilitation.
13. The HSRDC has taken up project preparation for upgrading roads in many districts. The sub-project under consideration forms part of Package 7 and links many villages to major arterial roads of Sonepat district. The upgrading proposal is for strengthening and capacity augmentation. The HSRDC has retained the service of M/s SAI Consulting Engineers Private Ltd for carrying out detailed engineering design report for proposed improvement of five roads in Sonepat districts. Most of the roads in this package are having single to intermediate lane width with bituminous pavement. The drainage conditions of the project roads especially in the village area are very poor. Concrete pavements are generally provided in the village areas. The horizontal geometry of the project roads is reasonable except at village sections where many sharp curves are observed. As the project area is in flat terrain, smooth vertical profile which meets the required design standards are generally observed on all the roads. There are no protected areas, wildlife sanctuaries or forests in the area.
14. The available ROW varies between 8 m-25 m and HSRDC expressed their intention that land acquisition should be used as last resort. In other words, improvement to road geometrics is to be within the available land width. As such, there is no need to design the road links for high speed as most of the road users have their prime concern to reduce wear and tear to their vehicle by plying over good surface instead of present poor road. Therefore, the scope of geometric improvement can be considered fairly limited for this project.

B. Project Components

15. The improvements proposed are as follows.
16. **Realignment and curvature improvement:** Improvements to the existing sub-standard geometrics at several locations especially the sharp curves with poor geometrics have been proposed, to enhance the safety along the road. These designs have been worked out within the available RoW to the extent possible. There are no bypasses / major realignments proposed. However, on tight locations (locations with potential land acquisition impacts and along stretches within the settlements where structures would be impacted), the design speeds has been kept as low as 15 km/hr.
17. **Road widening:** The present traffic has exceeded the design service volumes of the existing single / intermediate lane carriageway traffic warrants widening only to two lanes. Therefore, a 2 lane carriageway is planned.
18. **Profile improvement:** Some locations have been identified for improvement of either the longitudinal or vertical profile as required at the various stretches.
19. **Junction improvement:** Improvement to allow a safe connection to the corridor and minimum interference to the through traffic at all intersections is planned. If required, realignment is also suggested.
20. **Drainage:** Drainage is considered an important part of the project design and a proper drainage network has been considered is considered. This will consist of

- Covered lined drain in RCC M 20 grade in built-up areas as side drain.
- Open chute drain in Brick masonry in cement mortar 1: 3 on slopes of high embankment.
- No drains have been provided in open areas.

21. **Improvement of bridges and drainage structures:** The project road is proposed to be widened to 2-lane carriageway with paved shoulder. Most of the bridges have many common deficiencies/defects, which are proposed to be repaired. Improvement of 6 bridges and 119 culverts is proposed along the project roads.
22. **Superstructures:** Repair and reinforcement of superstructures will be considered for all structures on the identified roads. These will include,

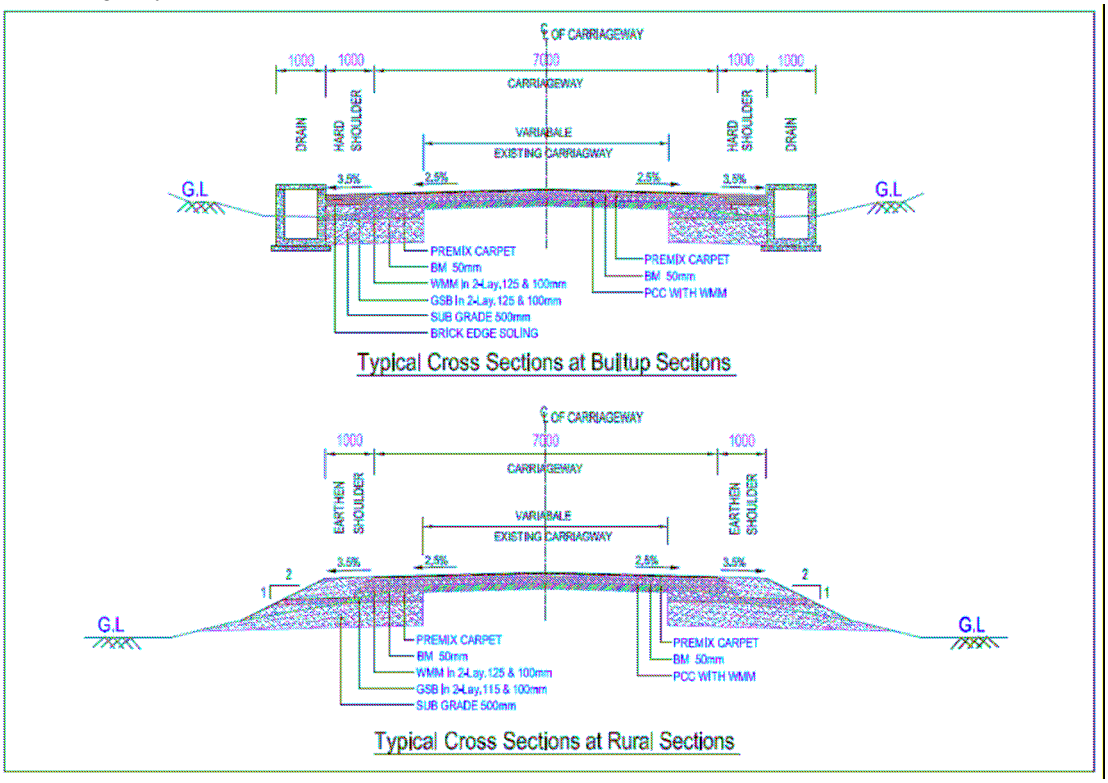
- **Waterways**: Cleaning of waterways will be undertaken if found chocked with vegetative growth or silted. If required, spurs and dykes will also be provided to reduce excessive scouring and change flow of direction.
- **Improvement of culverts**: In areas where improve design culverts will be recast, lengthened, cleaned of vegetation, or reconstructed or repaired, as required.

C. Design cross-sections

23. Designs are based on IRC codes - and typical cross section is presented In Figure 3. While these are the typical cross-sections, modifications to these have been worked out at locations with RoW constraints, either in rural areas or within built up stretches to minimize land acquisition and resettlement. Various typical cross sections are adopted for the project improvement proposal depending upon the lane width and drain type. Typical section generally adopted are listed below:

    - Two Lane rural section
    - Two Lane urban section

The proposed sections consist of 7m wide carriageways and 1m wide gravel shoulder on either side of the carriageway. The proposed sections meet the IRC requirements of ODR.



D. Design Standards

24. The project roads are proposed to be designed as per the standards of Other Districts Roads. Accordingly IRC 73 "Geometric Design Standards for Rural Highways-1980" published by the Indian Road Congress is referred for finalizing project design standards. The design parameters considered for the project road improvements are summarized in the **Table 6.10**.

Table 6.10 Design Parameters

S. No	Description	IRC Standards		
1	Design speed Plain and Rolling	Max – Min	65 - 50 km/hr	
2	Lane width		3.5 m	
3	Paved shoulder width		1.5 m	
4	Earthen Shoulder		1.0	
5	Road Way Width	Single Lane Two Lane	7.5 m 9.0 m	
6	Right of Way		15 m	
7	Cross-slopes	Carriageway Paved shoulder Unpaved shoulder	2.5 % 2.5 % 3.5 %	
8	Maximum super elevation		7.0 %	
9	Minimum horizontal curve radius	For 65 Km/hr For 50 Km/hr	150 m 90 m	
10	Radii beyond which super elevation not required	For 65 Km/hr For 50 Km/hr	750 m 450 m	
11	Super elevation runoff rate	For Plain and rolling For mountainous & steep	<1 in 150 <1 in 60	
12	Transition curves to be used with length of spiral more than or equal to length of super elevation runoff			
13	Extra widening of carriageway on curves	For curve radius >300m 101 to 300m	 Nil 0.6m	
14	Gradient	Ruling Gradient Limiting Gradient Exceptional Gradient	3.3 % 5 % 6.7%	
15	Minimum Length of Vertical Curves / Grade change not requiring vertical curve	Design Speed 65 km/hr 50 km/hr	min. curve length 40m 30m	max. grade change 0.8% 1.0%
16	Vertical curve 'K' values Crest vertical curve/Sag vertical curve	For design Speed 65 km/hr 50 km/hr	Crest 18.4 8.1	Sag 10 17.4
17	Vertical clearance	Road over road Road over railway Electrical lines H.T.Electrical lines Telecommunication Lines	5.5 m 6.525 m 6.0m (Up to 650 V) 6.5m (More than 650 V) 5.5m (Up to 110 V)	

25. The traffic projection for the design period of 10 years indicate that the projected traffic is within the design service volume of two lane road and therefore two lane road cross section is proposed for the project roads.

E. Implementation Schedule

26. The project is proposed to be implemented over a period of 18 months and as a single construction package. Consultations with the communities along the project roads indicated that the agriculture activities shall be impacted if the construction activities are taken up in the harvesting and sowing periods. The implementation schedule shall be worked out to ensure minimum disruption to the communities, due to the construction activities.

III. Description of the Environment

27. Sonipat district is located in the south-east of the State of Haryana. The district lies between 28°48'30" to 29°17'54" N latitude and 76° 28' 30" to 77° 13'40"E longitude.

A. Physical Environment

1. Topography

28. Sonipat district forms a part of the Indo-Gangetic plains and exhibit flat terrain with slope from north to south. This area is devoid of any prominent topographic features, except a natural depression in north and northwest of Gohana. Altitude of the plains in the district varies from 212 m to 230 m above mean sea level (MSL). The quaternary sediments of the area are composed of recent and fresh matter deposits of clay, silt and sand which are of loose to semi-consolidated nature of recent to sub-recent age. Topographically the district can be divided into three units, viz., (i) active flood plains along the present day course of the river Yamuna in eastern part of the district; (ii) abandoned flood plains of recent past, bordering the active flood plains and are wider, low lying flat tracts; and (iii) upland plains aligned along the western Yamuna canal representing the relatively older river deposits.
29. All the project roads pass through plain terrain with mild gradients. The Sonipat district, is part of the alluvial plain formed by the Yamuna and the Ganga rivers that occupies a major portion of NCR. In Jhajjar district most of the area is covered by Quaternary alluvium. The adjoining areas around the project roads mainly consist of flat agricultural fields and brick kilns. In addition to the few scattered water bodies and village ponds existing along the roads, borrowing of earth for brick kilns has resulted in depressions adjoining the identified roads.

2. Climate

30. The climate is characterized by an intensely hot summer and a cold winter. November to March is winter; summer season prevails during May and June. Temperature during January reaches 7.3°C, while in May and June reaches 47° C. Southwest monsoon fetches about 75% of rainfall between July to September, during this period weather is mild. Annual average rainfall in the district was 511.4 mm. During the monsoon period the district experiences high humidity; while in April and May it goes below 20%. Similarly, in the monsoon periods winds are strong, and in post-monsoon and winter months it is light. Thunder storm and dust storm, often accompanied with squalls (andhis) experienced during the period April to June.

3. Soils

31. Soils along the project roads vary from sandy to clayey loam, because of its presence in the banks of the Yamuna river and being a part of Indo-Gangetic alluvial plain. About 67 per cent soil in the district is sandy loam, 25.5 per cent sandy and 7.25 per cent clay. The soil is deficient in organic matter, salinity and alkalinity. Soil parameters observed for cultivation in the district show fertility of the land (pH – 6.5 to 8.6, Conductivity – below 2.5µmho/cm, Organic Carbon – below 0.4%, P – below 10 kg/ac, K – above 135 kg/ac, Zn – above 0.6 ppm, Mn – above 2.00 ppm, Iron – above 4.5 ppm). Soils in Gohana area of the district show pH of 8.0 to 8.9; conductivity (µmho/cm) – 0.13 to 1.14; Zn (ppm) – 0.68 to 3.04; Cu (ppm) – 0.48 to 1.66; Fe (ppm) – 5.30 to 23.98; Mn (ppm) – 4.36 to 11.61 *(Source: Soil Testing Register, 2009- KRIBHCO)*.

4. Geology

32. The geological classification of the project area has been broadly divided into two formations viz. the older alluvial formation and the Jamuna older alluvial formation. The older alluvial formation, occurs at higher level arid, and consists of silt, silty clay and clay, accompanying 'kankar' at certain places.

Jamuna older alluvial formation, consists of grayish silt, silty sand with sporadic pebbles of quartzites basic rock fragments and clay pockets, occurs concomitant to the Jamuna channel in the form of recent flood plain and low lying terrace deposits. Sand occurring in abundance in this district is useful for construction. Brick clays from silty clays used for brick making and salt peter in Gohana and Sonipat taluks are mineral resources in this district.

5. Water systems

33. There are no perennial rivers in this part of the NCR. However, there are some water bodies adjoining the identified roads, in form of village ponds and lakes. The water quality in the district varies with some areas showing excess levels (beyond permissible limits of GoI guidelines) of nitrates, fluorides, and fluoride. The water table is shallow and within 5 m depths in the northern parts of Jhajjar district. In the remaining parts of the district the water table is between 5 and 20 meters. In Jhajjar district fresh water aquifers of limited thickness are underlain by saline water aquifers, and have limited yielding potential. However, freshwater is available up to a depth of 30 meters in most parts of the district. At present, the water table in Jhajjar District, though is not overexploited, there are areas wherein the water is brackish.

6. Surface Water

34. The River Yamuna in the eastern side and Western Yamuna Canal passing through the district are the major sources of surface water. The drains constructed in the district take out excess monsoon water to Yamuna River. The water quality near National Highway No. 1 in Yamuna River is presented in Table below. Cadmium, Nickel, Chromium, Zinc and Iron are the heavy metals observed in the Yamuna river near the Sonipat district.

Parameter	Location along NH1 in Sonipat district	Permissible Standard
Temperature (°C)	14.0 to 32.0	
Dissolved Oxygen (mg/l)	5.7 to 12.0	> 4
pH	7.04 to 8.42	6.5 to 8.5
Free Ammonia (mg/l)	BDL to 1.77	
Total Kjeldhal Nitrogen(mg/l)	0.28 to 3.05	
COD (mg/l)	4 to 49	
BOD (mg/l)	1 to 6	< 3
Conductivity (µmho/cm)	192 to 619	
Total Coliform (Nos./100ml)	2900 to 8100	< 5000
Faecal Coliform (Nos./100ml)	560 to 110000	
Source: Water Quality Status of Yamuna River (1999-2005), CPCB		

35.

36. There are 20 minor bridges and 95 culverts existing along the project roads. There are no major river crossings, and the minor bridges are across the irrigation canals. Table xx summarizes the cross-drainage structures in the various sections along the project roads.

Table 1: Surface water crossings along the project roads

S.No.	Name of the Road	Chainage (m)		Minor Bridges across irrigation canals	Culvert
		From	To		
1	Gohana-Sisana Road	0+000	18+000	4	17
		18+000	18+800	-	1
		18+800	19+200	-	1

S.No.	Name of the Road	Chainage (m)		Minor Bridges across irrigation canals	Culvert
		From	To		
		19+200	25+200	-	9
		25+200	25+600	1	-
		25+600	28+500	-	4
2	Sonepat-Mehlana-Farmana Road	0+000	0+500	-	-
		0+500	1+600	-	-
		1+600	5+300	-	-
		5+300	5+800	-	-
		5+800	11+600	2	5
		11+600	12+600	-	5
		12+600	15+900	1	2
		15+900	16+500	-	1
		16+500	21+450	1	10
		21+450	22+000	-	-
3	Sonepat-Kakroi-Bidhlan Road VT	0+000	1+900	-	-
		1+900	2+500	-	-
		2+500	6+000	2	10
		6+000	6+100	3	-
		6+100	6+700	-	-
		6+700	7+000	-	1
		7+000	10+500	1	3
		10+500	11+300	-	-
		11+300	16+670	-	3
		16+670	16+800	-	-
		16+800	19+825	2	2
4	Jagsi-Gangana Road VT	0+000	1+000	-	1
		1+000	6+000	1	2
5	Kharkhauda-Assaudha Road	0+000	0+600	-	-
		0+600	2+700	-	1
		2+700	3+450	-	-
		3+450	7+500	-	8
		7+500	8+600	-	2
		8+600	11+200	-	1
		11+200	11+700	-	-
		11+700	12+400	-	-

S.No.	Name of the Road	Chainage (m)		Minor Bridges across irrigation canals	Culvert
		From	To		
		12+400	14+200	1	3
		14+200	15+600	1	1
		15+600	18+000	-	2
	Total			**20**	**95**

7. Ground water

37. Ground water occurs in depths of 10-25m in the district. The quality of ground water in shallow dug wells is fresh in the eastern and north, northwest parts and gradually gets deteriorated in the western and southwestern parts. The total replenishable ground water resource in the district is 449.58 mcm, while the total existing ground water draft by all means is 511.10 mcm. The shallow ground water of the district is alkaline in nature and with moderate to high mineral content with EC ranging from 597 to 6710µS/cm at 25°C. Ground water occurring in the southern and north-western parts of the district is more saline as compared to ground water occurring in the rest of the district. 68% of the ground waters are not suitable for drinking due to salinity, fluoride (13 mg/l) contents above permissible limits. The concentration of Arsenic (2 mg/l) and Iron (6 mg/l) are observed more than permissible limits in few areas.

8. Ambient Air quality

38. TSPM and PM_{10} observed in Sonipat were above the standard limits. Concentrations of SO_2 and NO_2 were found below the permissible limits. Higher concentration of TSPM and SO_2 observed during winter seasons causes respiratory diseases. Ambient air quality observed in Sonipat is depicted in the table

Parameter	Observed in Sonipat	Standards
TSPM (µ/m^3)	158.3 – 1756.6	50 – 100
PM_{10}(µ/m^3)	74.2 – 430	--
NO_2	19.7 – 78.4	30 – 120
SO_2	4.8 – 87	30 – 120

9. Ambient Noise Levels

39. Average noise levels monitored in Jhajjar district in rural and residential areas varied from 46.8 to 54.4 dB(A) during the day and 40.1 to 43.6 dB(A) at night, and are within the prescribed limits. Day time noise levels near the Jharli Railway station averaged 60 dB(A), exceeding the limit of 55 dB(A); while night time noise levels averaged 46.1 dB(A), exceeding the limit of 45 dB(A). The monitored noise levels for residential areas were within the prescribed limits.

10. Agriculture

40. Paddy, wheat, sugarcane and bajra contribute major crops in the project area due to good water holding capacity of the soil. Other crops include jawar, maize, cotton, moong gram, barley, oil seeds (such as Sarson, toria and tarmira/tira), robi pulses, and vegetables (such as tar or kakri, ghia, kadoo, tori, Petha, tinda, karela, brinjal, tomato, Bhindi (lady finger) and sweet potato in summer and radish, turnip, carrot, Palak, methi, cabbage in winter). Fruits grown include malta-orange, sweetlime, kaghzi lime, mango, guava and ber, pomegranate, grape and phalsa.

11. Ecological Resources

There are no reserved or protected forests or areas near and around the project roads. The Bhindawas Bird Sanctuary, situated about 50 km from the Kharkhauda-Assaudha Road, is the only protected area in the project districts. There are no impacts envisaged on this sanctuary due to the proposed road developments. Given that there are no major protected areas, and that the alluvial plains, and especially the project roads, are largely inhabited, there is hardly any wildlife existing, with exception of nilgai (blue bull). Flora and fauna in the district are not unique. No endangered flora and fauna is noted.

12. Fisheries

41. Surface waters in the form of river, drains, canals and ponds in the district facilitate growth of fisheries. Fish species noted in the district include Parri (Notopterus chitala (Hamilton)) and N.notopterus (Pallas) Parri Family Cyprinidae (Tne Carps), Katla, Theil (Catla catla (Hamilton)), Kalabans, Dhai (Labeo calbasu (Hamilton)), Rohu (L. rohita (Hamilton)), Akhrot (L. Pangusia (Hamilton)), Puntius sarana sarana (Hamilton) Family Bagridae (Catfishes), Aorichthys seenghala (Syes), Mystus vittatus (Bloch), Rita rita (Hamilton) Family Heteropneustidae (Catfishes), Heteropneustes fossilis (Bloch) Family Schilbeidae (Catfishes), Clupisoma garva (Hamilton), Silonia silondia (Hamilton) Family Siluridae (Catfishes), Wallago attu (Schneider) Family Sisoridae (Catfishes), Bagarius varrelli (Sykes) Family Channidae thurrels), Channa gaehua (Hamilton), C.marulius (Hamilton), C.Punctatus (Bloch), C.striatus (Bloch), Hurdwabra (Rhinomugil Corsula (Hamilton)).

13. Land use

42. Existence of fertile soil conditions and irrigation facilities favour utilisation of major portion of the land in the district for agricultural purposes; only a lesser portion is put to use for non-agricultural purposes. In the recent past several industries have been established and development induced by the growth of the National capital of Delhi led to more residential settlements in this district. Only 10 sq.km is under forest cover in this district.

14. Disasters

43. According to the Vulnerability Atlas of India the NCR falls in the,

- High damage risk zone (MSK VIII) for earthquakes
- Very high damage risk zone B (Vb = 50m/s) for wind and cyclone hazards
- Areas liable to floods, which are more site specific and consist of low-lying areas and the flood plain.

44. There are a number of faults and other tectonic features that trigger earthquakes in the NCR. The major ones are, Sohna fault, Aravalli fault, Hidden Moradabad fault in the Indo-Gangetic basin, Sonepat-Delhi-Sohna fault, Junction of Aravalli and Sohna fault, and the Delhi-Haridwar ridge. Earthquakes of intensity lower than four on the Richter scale have originated from 14 epicentres located in the NCR. Two major lineaments, namely Delhi-Hardwar ridge and Delhi- Moradabad fault, pass through the NCR, both having potential of generating earthquakes of magnitude up to 6.5 to 6.7 and normal depth of 30 kms. The NCR lies in the earthquake zone IV, the second highest vulnerable zones with respect to seismic impacts. The proposed design integrates the risks of seismic activities on the project roads, through adoption of the IRC codes and standards.

B. Economic Development

1. Population Characteristics

45. Total population of Sonipat district was 1,279,175 in Census 2001, representing 6.05% of Haryana State. About seventy five percent of total population lives in rural areas (74.88%) and 25.12% in urban areas (Urbanization of the state-28.9%). Sex-ratio of the district stood at 839 (rural-836, urban-847), when it was 860 for the State. Scheduled castes population is 18.09% (rural-18.91%;

urban-15.62%); while no Scheduled Tribe has been notified. Population below 6 years of age in Sonipat district is 15.36% (rural-15.87%; urban-13.85%), having sex-ratio of 788 (rural-792; urban-775). Total literacy rate (TLR) of the district was 72.79% as against 69.79% of Haryana, in rural areas it was 70.09% (State-63.19%) and in urban 80.64% (State-79.16%). Female literacy rate (FLR) in the district was 60.68% (rural-56.59%; urban-72.50%).

46. Workers participation rate (WPR) of the district was 40.89% of the total population; it was 44.59% in rural areas and 29.84% in urban. Sex-ratio of the total work force was 514 (rural-605; urban-207). Majority of the work force are main workers; 73.31% of the total workers are main workers (in rural-69.90%; in urban-88.53%). 52.97% of the total workers are engaged in cultivation and agricultural sector; it was 63.22% in rural and 7.31% in urban areas.

2. Industries

47. Agriculture is the major activity in the district. The village and cottage sector industries include pottery, carpentry, stone-dressing, leather-tanning, handloom weaving and utensil-making. Industries in this district are involved in manufacturing wooden products, agro products, chemical and rubber wares, engineering goods, sports and leather goods, mineral based products, textiles, pharmaceuticals, and chemicals. Most of the existing industrial units are concentrated at Sonepat and Kundli. Proximity to the National Capital of Delhi and other important industrial towns, and its connectivity by road and railway, growth of industries in this district shows a positive trend. This area has a number of quarries, stone crushers and brick kins that provide building material to Delhi and Gurgaon.

3. Health Facilities

48. Health services of the Government is rendered through 100 bedded hospital at Sonipat town, 7 community health centres (CHC) including one at Gohana town with 50 beds, and 29 primary health centres (PHC). Intestinal diseases are the major illness recorded throughout the district.

IV. Identification of Environmental Impacts and their Mitigation Measures

A. Land acquisition and resettlement impacts

49. The rehabilitation proposed for 4 of the 5 road corridors in Sonipat Division does not involve any land acquisition as all improvement works are proposed within the existing Right-of-Way (RoW). Only in one road corridor viz. Sonipat-Bidhlana, there is minimal land acquisition for a realignment proposed to improve a sharp curve. The land to be acquired is agricultural land measuring 0.3 acres. However, the project will impact two encroachers who have encroached upon the RoW and 13 community assets that have been built encroaching upon the RoW. There are no impacts to indigenous peoples.

50. In built-up stretches no widening is proposed in order to minimise involuntary resettlement and it has been proposed to only strengthen the existing road with proper drainage facility. Necessary traffic arrangement measures with proper signage have been proposed to ensure smooth flow of traffic in these constricted stretches.

51. The project will impact 2 households of whom 1 household would lose their place of residence and the other household their place of business. The project will also impact 13 common property resources that include 2 bus shelters, 2 places of worship, 4 water tank, 2 well, 1 community building and 2 compound walls of common property resources.

52. In line with the Draft ESMS of NCRPB, projects funded by NCRPB will require a resettlement plan and/or an indigenous peoples plan commensurate with the significance2 of impact. Rehabilitation of 5 roads in Sonipat Division will come under S-2 category for involuntary resettlement and S-3 category for indigenous peoples as per NCRPB's social categorization.

53. A short resettlement plan has been prepared in line with the Draft ESMS requirements. The summary of resettlement impacts is given in the following table.

Summary of Resettlement Impacts

Impact	Rehabilitation of 5 Roads in Sonipat Division
Permanent Land Acquisition (ha)	0.3 acres
Temporary Land Acquisition (ha)	0
Affected Households (AHs)	2 [a]
Affected Persons (APs)	8

[2] As per the Draft ESMS projects are categorized based on the significance of involuntary resettlement and impact to indigenous peoples. Involuntary resettlement categories are (a) Category S-1 (Significant Impact): means 200 or more people will experience major impacts, which are defined as (i) being physically displaced from housing, or (ii) losing 10% or more of their productive assets (income generating). Category S-1 projects require a full resettlement plan; (b) Category S-2 (Not Significant). Category S-2 projects include involuntary resettlement impacts that are not deemed significant and require a short resettlement plan; and (c) Involuntary Resettlement Category S-3: There is no involuntary resettlement impacts and hence does not require any action. Indigenous Peoples categories are (a) S-I Significant impacts are those projects that directly or indirectly affect the dignity, human rights, livelihood systems, or culture of indigenous peoples or affect the territories or natural or cultural resources that Indigenous peoples own, use, occupy or claim as their ancestral domain. Category S-1 projects will require a indigenous peoples plan; (b) S-2 Not Significant are projects where the indigenous peoples are the sole or the overwhelming majority of project beneficiaries, and when only positive impacts are identified. Category S-2 projects will require a summary note on IP in project document; and (c) S-3 are projects where no impacts on indigenous peoples are envisaged and hence does not require any action.

Impact	Rehabilitation of 5 Roads in Sonipat Division
Titled APs	0
Non-titled APs (Encroachers)	8
Female-headed AH	0
IP/ST-headed AH	0
BPL AH	0
Affected Structures	2
Affected Trees/Crops	0
Affected Common Property Resources	13
Average Family Size	4.0
Average Household Income	Rs.4,000/- p.m.
[a] *Both the households getting impacted will face significant impact*	

B. Environmental Impacts

54. The assessment for each physical component proposed for this project has been carried out with respect to the potential impacts during the following stages of the project planning and implementation:

- Location impacts. Impacts associated with site selection, including impacts on environment and resettlement or livelihood related impacts on communities
- Design impacts. Impacts arising from project design, including the type of designs, design standards etc
- Construction impacts. Impacts resulting from construction activities including site clearance, earthworks, civil works, etc.
- O&M impacts. Impacts associated with the operation and maintenance of the infrastructure built in the project.

55. The potential impacts occurring from this project have been identified below.

1. Location and design impacts

56. Location impacts are not likely to be significant as there are no major environmentally sensitive areas along the project roads. Impacts on water bodies along the project roads have been minimized through careful design of the alignments to avoid encroachment onto the water bodies. Impacts pertaining to cutting of roadside (including eucalyptus and acacia species) have been unavoidable and will be compensated through compensatory plantation. The impacts pertaining to road safety, especially for stretches in urban areas have been addressed through incorporation of appropriate safety measures in designs.

2. Construction impacts

57. The impacts during the construction stage shall include impacts associated with road construction activities and can be addressed through adoption of good engineering practices and undertaking specific mitigation measures towards minimization of construction impacts on the sensitive

receptors and communities in the vicinity of the project roads. The mitigation measures for the various impacts are outlined in the Table xx, and are summarized in the following sub-sections.

58. Drainage: Construction activities in the vicinity of natural drainage channels and water bodies, if drainage is not adequately provided, would cause change in the drainage character of the site and lead to water logging.
59. Soil: Construction of road increases the paved surface and permanent loss of top soil under these civil construction works. Excavation for forming the drains and borrowing also involves loss of top soil as well as scarifying the surface with construction machinery and equipment. Spillage of fuel, lubricants, other oils and chemicals will contaminate the soil in the area.
60. Sourcing of materials. While material such as bitumen may be acquired from local hot-mix plants and aggregate from already identified quarries, procurement of soil will still need to be carried out. Considering that the brick kins have already used the top soil in many areas, sites for the procurement of soil may have to be carefully identified.
61. Water Bodies: Stockpiles of construction debris if left unattended near water bodies as in Jasor Khari will be washed off as runoff into nearby water bodies causing siltation. Spillage of oil, lubricants and other chemicals also mix with the runoff and contaminate the water bodies.
62. Air Pollution: Emission from Construction Vehicles, Equipment and Machinery used for excavation and construction would induce impacts on the air pollution in the construction site as well as on the surrounding settlements. Construction activities generate dust in the surrounding area causing increase in particulate matter. Hot-mix plants installed for road construction will lead to generation of fugitive dust and exhaust emissions. Adequate siting criteria for the hot mix plants to be adopted based on the environmental sensitivity of surrounding land uses.
63. Noise and Vibration Impacts: Generation of noise from construction equipments is a major concern during construction stage. Use of heavy construction machinery in the construction site would generate vibrations and affect the adjacent structures in the settlements. Noise generated during construction is however intermittent and would be of limited duration but would affect the construction workers in case of unprotected prolonged exposure.
64. Material Handling: Storage of Bitumen and other hazardous material if stored near drainage channels would induce hazardous situations to the environment from possibility of leaching into ground and flow as runoff. Spillage of debris and construction material to surface water bodies may lead to surface water quality deterioration. Stockpiling of materials along the edge of the road will obstruct the drainage and restrict the free movement of vehicles.
65. Safety during construction: Appropriate measures during construction shall be worked out to address safety issues during construction. Prolonged exposure of workers to consistently high decibel noise levels above 90 dB(A) also induces hearing losses. Similarly, prolonged exposure of the workers to dusty environment of the construction site induces respiratory problems and loss of man days. Traffic diversions have to be notified sufficiently in advance and where necessary temporary diversions have to be provided for safe crossing of the traffic.
66. Site clearance and Restoration of Construction Camps: Post construction clearance if not adequate, would create unsightly conditions and affect aesthetics of the area. Campsites if not removed usually become a refuge for unscrupulous activities and sometimes develop as another settlement putting strain on the resources. Sanitary pits may cause contamination of surface and ground water.

3. Operational impacts

67. Impacts on environmental conditions associated with the operation stage of the project are identified to be due to increased of air and noise pollution from the increased vehicular traffic along the route. The proposed improvements and safety provisions, in areas such as Assoda would reduce accidents and congestion and result in more public and private transport vehicles also plying in the area. Improved drainage provision within the settlements shall ensure avoidance of water logging and poor drainage conditions along the project roads.

V. Environmental Management Plan

68. Potential environmental impacts identified in the IEE due to implementation of the project components are to be minimized or avoided through appropriate mitigation and avoidance measures mentioned in Table 5. The agencies that are responsible for implementing the measures that are required to be undertaken have been identified.

Table 2: Environmental Impacts and mitigation measures

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
1	Location Impacts				
1.1	Land acquisition and resettlement impacts required due to widening of roads at certain locations, where required.	Permanent	Major	Land acquisition impacts to be minimal as the proposed strengthening of the road will be restricted to the existing RoW. Affected Persons, if any, will be relocated and compensated in accordance to the RP	HSRDC & Design Consultants
2	Design and pre-construction Impacts				
2.1	Alterations of drainage pattern of the site	Permanent	Major	Design of cross drainage structures would be carried out so as to avoid alteration of drainage pattern. Design would be done considering 50 year return flood level to avoid overtopping of the roads and maintain natural drainage	HSRDC, Design Consultants
2.2	Damage to roadside trees	Permanent	Severe	If removal of any tree is unavoidable, obtain tree clearance approval from Forest Department. Identify each tree along the proposed route and adequately mark each tree within proposed construction areas. For trees not proposed to be cut, but within the construction area, take all precautions to protect trees not impacted from any damage including placement of tree guards	HSRDC & Design Consultants
2.3	Impact on cultural properties, shrines, temples etc	Permanent	Temporary	The designs shall be worked out to minimize impacts on cultural properties, shrines etc. All precautionary measures to address impacts on structures including protection measures required shall be provided in the designs.	HSRDC & Design Consultants
3	Pre-construction Activities by Contractor				
3.1	Construction Camps – Location, Selection, Design and Layout	Temporary	Moderate	The construction camps will be located at least 500m away from habitations at identified sites.	Contractor / Management Consultant
3.2	Drinking water availability and water arrangement	Temporary	Severe	The contractor will be responsible for arrangement of water in every workplace at suitable and easily accessible place for the whole construction period. Sufficient supply of cold potable water (as per IS: 10500) to be provided and maintained. If the drinking water is obtained from an intermittent public water supply then, storage tanks will be provided.	Contractor / Management Consultant
	Establishment of construction camps and / or hot mix plants, if required	Temporary	Moderate	Obtain the consent-to-establish and consent-to-operate from the Pollution Control Board Adhere to the air pollution and water pollution standards prescribed.	HSRDC, PMC & Contractors
3.3	Identification of disposal sites	Permanent	Major	Location of disposal sites will be finalized based on consultations with the Engineer. The Engineer will certify these are not located within designated environmentally sensitive areas and confirm that: Disposal of the material does not impact natural drainage courses No endangered / rare flora is impacted by such material Settlements are located at least 1000m away from the	Contractor / Management Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				site	
3.4	Quarry Operations	Permanent	Major	It has to be ensured that materials are obtained from licensed quarries having environmental clearance. Quality and legality to be examined by the Contractor and copies of environmental clearances for these needs to be submitted prior to sourcing of material.	Contractor / Management Consultant
3.5	Batching Plants	Temporary	Moderate	Batching plants will be located sufficiently away from habitation, where possible such plants will be located at least 1000m away from the nearest habitation. The contractor will obtain the consent to operate the plants from the SPCB.	Contractor / Management Consultant
4	Construction Impacts				
4.1	Improper stockpiling of construction materials can cause impacts starting from obstruction of drainage, disturbance/ safety hazard to local population, traffic blockage, etc.	Temporary	Moderate	Due consideration will be given for material storage and construction sites such that it doesn't cause any hindrance to daily traffic movement. Stockpiles will be covered to protect from dust and erosion.	Contractor / Management Consultant
4.2	Quarry / Borrow pits Operations	Permanent	Moderate	Adequate safety precautions will be ensured during transportation of quarry material from quarries to the construction site. Vehicles transporting the material will be covered to prevent spillage. Operations to be undertaken by the contractor as per the direction and satisfaction of the Engineer.	Contractor / Management Consultant
4.3	Stripping, stocking and preservation of top soil	Permanent	Moderate	The topsoil from borrow areas, areas of cutting and areas to be permanently covered will be stripped to a specified depth of 150mm and stored in stockpiles. The stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and the height of the pile is to be restricted to 2m. Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur. The stockpiles will be covered with gunny bags or tarpaulin. It will be ensured by the contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles. Such stockpiled topsoil will be returned to cover the disturbed area and cut slopes.	Contractor / Management Consultant
4.4	Soil Erosion	Permanent	Moderate	At the outfall of each culvert, erosion prevention measure, will be undertaken, as per the direction and satisfaction of the Engineer The work will consist of measures as per design, or as directed by the Engineer to control soil erosion, sedimentation and water pollution. All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earthwork or other items of work.	Contractor / Management Consultant
4.5	Compaction of Soil	Temporary	Minor	To minimize soil compaction construction vehicle, machinery and equipment will move or be stationed in designated area (RoW or CoI, haul roads as applicable) only. The haul roads for construction materials will be routed to avoid agricultural areas	Contractor / Management Consultant
4.6	Blasting	Permanent	Moderate	Except as may be provided in the contract or ordered or authorized by the Engineer, the Contractor will not use explosives. Where the use of explosives is so provided or ordered or	Contractor / Management Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				authorized, the Contractor will comply with the requirements of the following Sub-Clauses of MoRTH 302 besides the law of the land as applicable. The Contractor will at all times take every possible precaution and will comply with appropriate laws and regulations relating to the importation, handling, transportation, storage and use of explosives and will, at all times when engaged in blasting operations, post sufficient warning flagmen, to the full satisfaction of the Engineer. The Contractor will at all times make full liaison with and inform well in advance and obtain such permission as is required from all Government Authorities, public bodies and private parties whomsoever concerned or affected or likely to be concerned or affected by blasting operations. Blasting will be carried out only with permission of the Engineer. All the statutory laws, regulations, rules etc., pertaining to acquisition, transport, storage, handling and use of explosives will be strictly followed. all directions at least 10 minutes before the blasting.	
4.8	Loss of Access	Temporary	Moderate	The contractor will provide safe and convenient passage for vehicles, pedestrians and livestock to and from side roads and property access connecting the project road. Construction activities that will affect the use of side roads and existing access to individual properties will not be undertaken without providing adequate access. The construction works will not interfere with the convenience of the public or the access to, use and occupation of public or private roads, or any other access to properties, whether public or private.	Contractor / Management Consultant
4.9	Soil and Water Pollution due to fuel and lubricants, construction waste	Temporary	Moderate	The fuel storage and vehicle cleaning area will be stationed such that runoff from the site does not drain into the water body. Oil interceptor will be provided at construction vehicle parking area, vehicle repair area and workshops ensuring that all wastewater flows into the interceptor prior to its discharge.	Contractor / Management Consultant
4.10	Siltation of Rivers and streams due to spillage of construction wastes	Temporary	Moderate	Silt fencing to be provided at all water bodies near construction sites to prevent sediments from the construction site to enter into the watercourses. The number of units of silt fencing to be installed is to be decided by the engineer. Discharge standards promulgated under the Environmental Protection Act, 1986 for surface water bodies will be strictly adhered to. No disposal of construction wastes will be carried out into the river.	Contractor / Management Consultant
4.11	Generation of Dust	Temporary	Moderate	The contractor will take every precaution to reduce the levels of dust at construction sites to the satisfaction of the Engineer. All earthwork to be protected/covered in a manner acceptable to the satisfaction of the engineer to minimise dust generation.	Contractor / Management Consultant
4.12	Emissions from batching plants	Temporary	Moderate	Batching plants will be located atleast 500m away from environmentally sensitive areas as Reserved Forests / National Parks and sensitive receptors i.e., hospital and college. The exhaust gases will comply with the requirements of the relevant current emission control legislation. All operations at plants will be undertaken in accordance with all current rules and regulations protecting the environment. Monitoring of air and noise	Contractor / Management Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				parameters will be as per monitoring plan	
4.13	Emission from Construction Vehicles, Equipment and Machinery	Temporary	Moderate	The discharge standards promulgated under the Environmental Protection Act, 1986 will be strictly adhered to. All vehicles, equipment and machinery used for construction will conform to the relevant Bureau of Indian Standard (BIS) norms. All vehicles, equipments and machinery used for construction will be regularly maintained to ensure that pollution emission levels comply with the relevant requirements of SPCB and the Engineer. 'PUC' certificates will be obtained regularly for all vehicles used for the project. Copies will be submitted regularly to the Engineer.	Contractor / Management Consultant
4.14	Dust Pollution from Crushers	Temporary	Minor	All crushers will obtain siting clearance from SPCB or only those crushers that have already have obtained license from SPCB will be used.	Contractor / Management Consultant
4.15	Noise from construction Equipments	Temporary	Moderate	Maintenance of vehicles, equipment and machinery will be regular and to the satisfaction of the Engineer, to keep noise from these at a minimum. All vehicles and equipment used for construction will be fitted with exhaust silencers. During routine servicing operations, the effectiveness of exhaust silencers will be checked and if found to be defective will be replaced. Noise limits for construction equipment used in this project (measured at one metre from the edge of the equipment in free field) such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws will not exceed 75 dB (A), as specified in the Environment (Protection) Rules, 1986 Notwithstanding any other conditions of contract, noise level from any item of plant(s) must comply with the relevant legislation for levels of noise emission.	Contractor / Management Consultant
4.16	Traffic Control and Safety	Temporary	Moderate	The contractor will take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, marking flags, lights and flagmen as per Engineer's direction and satisfaction, for the information and protection of traffic approaching or passing through the section under improvement. Before taking up any construction, detailed Traffic Control Plans will be prepared and submitted to the Engineer for approval, 5 days prior to commencement of work on any section of road. The traffic control plans shall contain details of arrangements for construction under traffic and details of traffic arrangement after cessation of work each day. The Contractor will ensure that the running surface is always maintained in good condition, particularly during the monsoon so that no disruption to traffic flow occurs	Contractor / Management Consultant
4.17	Road furniture	Temporary	Minor	All roadside structures / furniture, protection, intersections, traffic islands, rotaries, facilities and amenities etc. will be constructed as per engineering design and to the satisfaction of the engineer. Similarly restoration of bus shelters including bus bays complete with seating arrangement, other infrastructure etc. will be carried out as per design and to the satisfaction of the engineer.	Contractor / Management Consultant
4.18	Material Handling at Site	Temporary	Minor	All workers employed on mixing asphaltic material, cement, concrete etc., will be provided with protective	Contractor / Management

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				footwear and protective goggles. Workers, who are engaged in welding works, would be provided with welder's protective eye-shields. Workers engaged in stone breaking activities will be provided with protective goggles and clothing and will be seated at sufficiently safe intervals. The use of any toxic chemical will be strictly in accordance with the manufacturer's instructions.	Consultant
4.19	Disposal of Bituminous wastes / Construction Waste / Debris / Cut Material	Temporary	Moderate	The bituminous waste generated will be reused in road construction based on its suitability of reuse to the maximum extent possible. Safe disposal of the extraneous material will be ensured in the pre-identified disposal locations. In no case, any construction waste will be disposed around the project road indiscriminately. Cut material generated because of construction will be utilized for as filling material. Remaining material if any will be disposed off safely at the disposal sites.	Contractor / Management Consultant
4.20	Safety Measures During Construction	Temporary	Moderate	All relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996 will be adhered to. Adequate safety measures for workers during handling of materials at site will be taken up. The contractor has to comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress. The Personal Protective Equipment for workers on the project will conform to respective IS codes.	Contractor / Management Consultant
4.21	Risk caused by Force Majure	Temporary	Minor	All reasonable precaution will be taken to prevent danger of the workers and the public from fire, flood, drowning, etc. All necessary steps will be taken for prompt first aid treatment of all injuries likely to be sustained during the course of work.	Contractor / Management Consultant
4.22	Malaria Risk	Temporary	Minor	The Contractor will, at his own expense, conform to all anti-malaria instructions given to him by the Engineer.	Contractor / Management Consultant
4.23	First Aid	Temporary	Minor	At every workplace, a readily available first aid unit including an adequate supply of sterilized dressing material and appliances will be provided as per the Factory Rules. Suitable transport will be provided to facilitate transfer of injured or ill person(s) to the nearest hospital. At every workplace and construction camp, equipment and nursing staff will be provided.	Contractor / Management Consultant
4.24	Hygiene	Temporary	Minor	All latrines will be provided with dry-earth system (receptacles), which will be cleaned at least four times daily and at least twice during working hours and kept in a strict sanitary condition. Receptacles will be tarred inside and outside at least once a year. All temporary accommodation must be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing. Garbage bins must be provided in the camps and regularly emptied and the garbage disposed off in a hygienic manner. Adequate health care is to be provided for the work force. Unless otherwise arranged for by the local sanitary authority, the local medical health or municipal authorities will make arrangement for disposal of excreta.	Contractor / Management Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				On completion of the works, all such temporary structures will be cleared away, all rubbish burnt, excreta tank and other disposal pits or trenches filled in and effectively sealed off and the outline site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the engineer.	
4.25	Archaeological Property chance find	Temporary	Minor	The contractor will take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing and will, immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out the Engineer's instructions for dealing with the same, awaiting which all work will be stopped 100 m all directions from the site of discovery. The Engineer will seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence work on the site.	Contractor / Management Consultant
4.26	Clearing of Construction of Camps & Restoration	Temporary	Major	Contractor to prepare site restoration plans for approval by the Engineer. The plan is to be implemented by the contractor prior to demobilization. On completion of the works, all temporary structures will be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the Engineer.	Contractor / Management Consultant
5	O&M Impacts				
5.1	Environmental Conditions	Permanent	Moderate	The HSRDC will undertake seasonal monitoring of air, water, noise and soil quality through an approved monitoring agency. The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored will be as per the Monitoring Plan prepared.	HSRDC
	Survival of trees planted	Permanent	Moderate	Proper care shall be taken to increase survival rate of saplings like regular watering, pruning, provision of tree guards, manure for better nourishment, etc. including timely replacement of perished saplings.	HSRDC
5.2	Increased air and noise pollution due to increased traffic using the improved roads	Permanent	Moderate	Smooth and better road surface will reduce generation of noise. Provision of vegetative barriers where ever possible. Other measures such as improved transport fuel quality, more stringent environmental norms, installation of no horn signages at educational institutes and at hospitals	HSRDC
5.3	Drainage of roadsides	Permanent	Moderate	To ensure efficient flow of surface water and to prevent water logging along the side of the roads adequate size and number of cross-drainage structures and longitudinal drains are provided in the design. These will be adequately maintained by cleaning and avoiding clogging of openings.	HSRDC
5.4	Traffic and Accident Safety	Permanent Risk	Major	Depending on the level of Congestion and traffic hazards, traffic management plans will be prepared. Traffic control measures including speed limits to be enforced strictly. Road control width to be enforced. Local government bodies and development authorities will be encouraged to control building development along the highway.	HSRDC

VI. Institutional Requirements

A. A. Institutional Arrangements

69. Haryana State Roads Development Corporation (HSRDC), as the Implementing Agency (IA) will undertake all actions for the implementation of the project. HSRDC will have one specialist identified to overseeing the implementation of the EMP, and will be outsourced. An Environmental Officer (consultant) shall be inducted within the HSRDC to address the environmental impacts due to the project. The identified officer should be a Civil Engineer specializing in Environment or a related field with experience in the management of infrastructure projects. S/he should be similar with Indian legislation and the implementation of multi/bilateral loan projects.
70. Roles and Responsibilities

- Review of IEE and other environment documents based upon ADB's Environmental Assessment Guidelines, or other multilateral or bilateral agency guidelines, as required.
- Liaise and obtain clearances from with required state and central departments for clearances and compliance to regulations.
- Monitor and oversee the implementation of the Environmental Management Plan
- Ensure inclusion of EMP in contractor's ToRs.
- Oversee implementation and monitor compliance to the EMP
- Undertaken required interactions with civil society groups and community for projects under implementation
- Ensure inclusion of public concerns and grievances in EMP and project implementation. Undertake dialogue with affected communities, as required.
- Review environmental performance of project through periodical environmental monitoring reviews. Where additional environmental safeguards are identified incorporate them in project design, construction or implementation or other follow-up actions, as required.
- Provide required support for the management of environmental concerns in the implementation of the project
- Develop, review and plan and implement training and capacity building for contractors and consultants involved in the project

71. A consultant shall be hired for supervising construction activities. This agency will need an officer identified for overseeing the implementation of the EMP. The roles and responsibilities of this individual will be,

- Work closely with Corporation's environmental specialist for the implementation of EMP and ensure compliance to environmental safeguards, support its implementation
- Work with Corporation's environmental specialist for getting environmental clearances for the project
- Review of EMP implementation and advice the Corporation's environmental specialist on the implementation status
- Review any changes in project design, identify environmental safeguards if required and work with the Corporation's environmental specialist to reflect identified safeguards in EMP
- Ensure all identified systems – safety, accident management and control, waste are in place, functioning and implementing personnel have adequate training to implement actions
- Ensure that all safety gear for workers and on the project location are in place
- Consultation with stakeholders and inclusion of their concerns in project implementation
- Incorporate additional environmental safeguards as required during project implementation

B. Environmental Monitoring Plan

72. Prior to developing a monitoring plan there is a need for the development of a baseline for some activities. This would help with the monitoring activities. The baseline is described below.

1. Development of a baseline

73. Prior to developing a monitoring plan there is a need for the development of a baseline for some activities. This would help with the monitoring activities. The baseline is described below.

Sl. No.	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Responsibility	Cost estimates INR
1	Air Quality	Pre construction	SPM and RSPM, NOx, CO	Ten – two on each of the roads – for all 5 roads, near habitations.	In morning, rush hours or time of high traffic and late evening	DPR consultant	4000/sample
2	Noise	Pre construction	Decibels	Ten – two on each of the roads – for all 5 roads, near habitations.	n morning, rush hours or time of high traffic and late evening	DPR consultants	1000/sample
3	Water quality	Pre construction	Surface water quality	Sample waterbodies along with construction activities will be undertaken	Once, prior to construction	DPR consultants	2000/ sample
4	Site for quarries and borrow pits	Pre construction	The site situation – for rehabilitation, photographs	All sites identified for quarries, borrow pits, waste and construction labour camps and offices	Once prior to construction	DPR consultants/ agency identified to supervise construction	30,000 lump sum
5	Vegetation removal	Pre construction	Vegetative survey to identify type and amount of vegetation that requires to be replaced	Along paths that are to be cleared off trees for construction activities	Once prior to construction	DPR consultants	300000 lump sum

2. Monitoring Actions

Sl. No.	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Responsibility	Cost estimates INR
1	Air Quality	Construction	SPM and RSPM, NOx, CO	Ten – two on each of the roads – for all 5 roads, near habitations.	Thrice annually	Contractor	4000/sample
2	Noise	Construction	Decibels	Ten – two on each of the roads – for all 5 roads, near habitations.	Thrice annually	Contractor	1000/sample
3	Water quality	Construction	Surface water quality	Sample waterbodies along with construction activities will be undertaken	Thrice annually	Contractor	2000/sample
4	Site for quarries and borrow pits	Construction	After construction activity over – if rehabilitated	All quarries, borrow pits, waste and construction labour camps and offices sites	Once prior to construction	Contractor	40,000 total
5	Tree/vegetation plantation	Construction	Ensure all vegetation/tree replacement activity undertaken	Based upon discussions with local community and Forest Department	During construction	Contractor	40,000 total

6	Air Quality at Residential area	Operation	RPM, SPM, SO_2, NO_x, CO and Hydrocarbons	At ten locations, especially around sensitive receptors and settlements	Once in a season (except monsoons) for the first 3 years of operation	Contractor	100000 per year
7	Noise Levels at residential and silence zone	Operation	Equivalent Day & Night Time Noise Levels	At ten locations, especially around sensitive receptors and settlements	Once in a season for the first 3 years of operation	Contractor	50000 per year

C. Training & Capacity Building

74. The training programme will start with a Sensitization Workshop for officials of HSRDC and also the Contractor's personnel. Typical modules that would be present for the training session would be as follows:

- Sensitization
- Introduction to Environment Considerations in Urban Development Projects
- Review of IEE and Integration into Design
- Improved Co-ordination within Nodal Departments, on special issues, if any.
- Role during construction
- Monitoring & Reporting System

75. The proposed training program along with the frequency of sessions is presented in the table below.

Program	Description	Participants	Form of Training	Duration	Trainer / Agency
Introduction and sensitisation to environment issues	Sensitisation on environmental concerns ▪ Environmental impacts of road's projects ▪ GoI environmental regulations ▪ ADB/multilateral/bilateral environmental regulations ▪ Coordination between departments for implementation of environmental safeguards	Senior department engineers HSRDC officials responsible for implementing project and office in-charge of implementing environmental safeguards	Workshop	Half day workshop	External Consultants/ NCRPB
EMP implementation	Implementation of environment EMP ▪ Identification of environment impacts ▪ Monitoring and reporting for EMP ▪ Public interactions and consultations ▪ Identification of various government	Department head at Haryana PWD B&R and HSRDC in-charge of the project, officer in-chare of project implementation, identified officer in-charge of implementing EMP	Lectures and field visit		External Consultants/ NCRPB
EMP implementation	Implementation of EMP ▪ Identification of environment impacts ▪ Monitoring and reporting for EMP ▪ Public interactions and consultations	Officer in charge of implementing this project activities at HSRDC, officer implementing EMP for agency/contractors	Lecture and field visit	One day session	External Consultants/ NCRPB
Implementation of EMP	Reporting and coordination	Officer in charge of implementing this project activities, officer	Lecture and interactive session	Half day session	External Consultants/

	▪ Coordination for consents and with various departments ▪ Identification of environmental impacts ▪ Monitoring formats filling and review of impacts	implementing EMP for agency	session		NCRPB
Recurring training programmes	Management of Environmental impacts Identification of Environmental impacts Environmental regulations Environmental monitoring and review	Department head at Haryana PWD B&R and HSRDC in-charge of the project, officer in-chare of project implementation, identified officer in-charge of implementing EMP	Lecture and interactive session	One day session	External Consultants/ NCRPB

D. Environmental Budget

76. As part of good engineering practices in the project, there have been several measures as erosion prevention, rehabilitation of borrow areas, safety, signage, provision of temporary drains, etc the costs for which will be included in the design costs. Therefore, these items of costs have not been included in the IEE budget. Only those items not covered under budgets for construction and RP are costed in the IEE budget. The IEE costs include mitigation, monitoring and capacity building costs. The summary budget for the environmental management costs for the project is presented in the following table.

Sl. No.	Particulars	Stages	Unit	Total number	Rate (INR)	Cost (INR)
A.	Mitigation Measures					
1	Management of dust and sand during construction activities – suppression etc	Construction	Lump sum			200,000
2	Ensuring occupational safety for workers at camps and construction sites	Construction	Lump sum			400,000
	Sub -Total (A)					600,000
B.	Monitoring Measures					
	Water quality	Pre-Construction / Construction	Per sample	20	4000	80,000
	Air	Pre-Construction / Construction	Per sample	50	2000	100,000
	Noise	Pre-Construction / Construction	Per sample	50	1000	50,000
	Borrow pits sites etc	Pre-Construction / Construction	Lump sum			70,000
	Vegetation/tree survey and monitoring implementation of tree plantation	Pre-construction / construction	Lump sum			70,000
	Sub -Total (B)					370,000
C	Capacity Building					

Sl. No.	Particulars	Stages	Unit	Total number	Rate (INR)	Cost (INR)
2	Sensitisation, awareness	Pre-construction	Lump sum			472000
3	Monitoring and management	Construction	Lump sum			187000
	Sub-Total (C)					659000
	Total (A+B+C), INR					1,629,000

VII. Public Consultation and Information Disclosure

A. Process of Consultation Followed

77. During the preparation of the project, consultations with stakeholders were held on environmental issues with HSRDC, communities along the project roads and affected persons. The general impression from the consultations was that all stakeholders were glad for the development as it would result in a better environment in the area, ease traffic and reduce travel time, and will also result in fewer accidents. Summary of the consultations undertaken is given in Table below.

Table 3: Summary of Consultations

S.No.	Place	Date	Number of participants	Participants	Issues discussed
1	Sonepat	October – November 2009	5	Divisional Engineer, HSRDC and Engineers, Sonipat Division	Design modifications to minimize environment, land acquisition impacts Clearance requirements, w.r.t tree cutting, no-objections from SPCB etc Overview of ESMS, ADB policies on environmental assessment etc Draft version of the IEE, identification of measures to address environment impacts.
1	Local restaurant Assoda	28 November, 2009	15	Village Communities, residents along the road	The road width is insufficient as the traffic is heavy in the area Some areas have very poor road design and therefore when overtaking heavy vehicles turn turtle and go off the road. Speed breakers are a must as there are a number of heavy vehicles that drive badly and can risk local users of the road A special area should be left for cycles, pedestrians etc
3	Assoda	28 November, 2009	10	Residents	Need for speed breakers in front of schools and where village roads meet the main road and in front of the bus stops There is a need for proper drainage to reduce the possibility of damage to the roads. Culverts are also required Heavy vehicles like trucks and tankers use the road therefore roads should be designed to keep this in mind
4	Borada	28 November, 2009	25	Residents	The traffic for present road width is very high. There is insufficient safety provisions – speed breakers and shoulders Roads quality should be good to reduce noise from moving vehicles Along with roads, drain improvement must be considered There is encroachment from residents on the area demarcated for roads, and may need to be removed to have wide roads

B. Framework for continued public participation

78. A grievance redressal cell will be set up within the HSRDC to register grievances of the people regarding technical, social and environmental aspects. This participatory process will ensure that all views of the people are adequately reviewed and suitably incorporated in the design and implementation process. Further, to ensure an effective disclosure of the project proposals to the

stakeholders and the communities in the vicinity of the project locations, an extensive project awareness campaigns will be carried out.

79. For the benefit of the community the Summary IEE will be translated in the local language and made available at: (i) Office of the HSRDC Division at Sonipat; and, (ii) Office of the District Commissioners, Sonipat and Jhajjar districts. These copies will be made available free of cost to any person seeking information on the same. Hard copies of the IEE will be available in the HSRDC office as well as the local library, and accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. On demand, the person seeking information can obtain a hard copy of the complete IEE document at the cost of photocopy from the office of the Divisional office of the HSRDC at Sonipat, on a written request and payment for the same. Electronic version of the IEE will be placed in the official website of the HSRDC and the website of ADB after approval of the documents by Government and ADB. The HSRDC will issue notification on the disclosure mechanism in local newspapers, ahead of the initiation of implementation of the project, providing information on the project, as well as the start dates etc. The notice will be issued in local newspapers one month ahead of the implementation works. This will create awareness of the project implementation among the public. Posters designed to mass campaign the basic tenets of the IEE will be distributed to libraries in different localities that will be generating mass awareness.

VIII. Findings and Recommendations

80. It is to be noted that as per the statutory requirements of Government of India (Environmental Impact Assessment Notification, September 2006, and its subsequent amendment 2009) Environmental Impact Assessments are not required for the proposed road improvements. The proposed development does not fall either in Category A or in Category B as per GoI EIA requirements. The significance of the environmental impacts will be more due to the construction related impacts than any impacts associated with areas of rich environmental sensitivity. It is to be noted that the resultant potential impacts from these proposals can be offset through provision of proven mitigation measures during the design and adoption of good engineering practices during construction and implementation. EMP prepared to this affect addresses these potential impacts through appropriate mitigation, management and monitoring measures. The effective implementation of the measures proposed will be ensured through the building up of capacity towards environmental management within the HSRDC supplemented with the technical expertise of an Environmental Specialist as part of the Management Consultants. Further, the environmental monitoring plans prepared as part of the EMP provide adequate opportunities towards course correction to address residual impacts during construction stages.

IX. Conclusions

81. The project will have a number of benefits such as – reduced time taken to travel on the roads with reduced congestion, reduced accidents on the road and smoother flow of traffic. Also, considering the low levels of environmental impacts expected it will not require any major mitigation. The proposed components should proceed through to design and implementation, subject to mitigation measures and monitoring programs as per EMP for potential impacts identified in the IEE. These will be updated and detailed during detailed design stage, and based on above recommendations. It may be emphasized that the present IEE, which identifies potential impacts and EMP which presents appropriate mitigation measures, is sufficient enough to safeguard the environment. There are no significant adverse impacts, which are irreversible or may lead to considerable loss/destruction of environment, envisaged. All the impacts are generic and have proven mitigation measures to minimize/mitigate the same.

X. Appendix 1: REA Checklist

ROADS AND HIGHWAYS

Instructions:

- This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
- Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: Sonipat Roads, Haryana. NCRPB, India

Sector Division:

SCREENING QUESTIONS	Yes	No	REMARKS
A. PROJECT SITING IS THE PROJECT AREA ADJACENT TO OR WITHIN ANY OF THE FOLLOWING ENVIRONMENTALLY SENSITIVE AREAS?			There are no special or protected areas.
▪ CULTURAL HERITAGE SITE	☐	■	
▪ PROTECTED AREA	☐	■	
▪ WETLAND	☐	■	

SCREENING QUESTIONS	Yes	No	REMARKS
▪ MANGROVE	☐	■	
▪ ESTUARINE	☐	■	
▪ BUFFER ZONE OF PROTECTED AREA	☐	■	
▪ SPECIAL AREA FOR PROTECTING BIODIVERSITY	☐	■	
B. POTENTIAL ENVIRONMENTAL IMPACTS WILL THE PROJECT CAUSE…			
▪ encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries?	☐	■	
▪ encroachment on precious ecology (e.g. sensitive or protected areas)?	☐	■	
▪ alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?	■	☐	The topography of the area is relatively flat. There are a few village ponds near the roads as they pass through the villages. Surface runoff during rains could lead to stagnating water in the fields adjoining the roads or in the villages. The project design therefore needs to include culverts and road side drainage.
▪ deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	■	☐	Concerns may exist as there will be a need to get labour from outside, therefore requiring labour camps.
▪ increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?	■	☐	This would occur, however as it is planned to procure all material from the
▪ noise and vibration due to blasting and other civil works? ▪ dislocation or involuntary resettlement of people	■	☐	Increasing noise and vibrations during construction and civil works shall be an impact, to address which, construction timing therefore will need to ensure that disruptions are low.
▪ other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress?	■	☐	Road widening may result in some areas encroached upon requiring acquiring.
▪ hazardous driving conditions where construction interferes with pre-existing roads?	☐	■	

SCREENING QUESTIONS	Yes	No	REMARKS
▪ poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?	■	☐	Local population do not work as construction labour, therefore workers from outside will be specially brought for the construction of the road, requiring labour camps and associated amenities.
▪ creation of temporary breeding habitats for mosquito vectors of disease?	■	☐	At labour camps, quarries and borrow pits the possibility of temporary breeding habitats for mosquito vectors is possible.
▪ dislocation and compulsory resettlement of people living in right-of-way?	☐	■	There is nobody living in right of way. The identified land is mainly for agricultural
▪ accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials and loss of life?	☐	■	
▪ increased noise and air pollution resulting from traffic volume?	☐	■	
▪ increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?	☐	■	

Environmental Assessment Document

F. REHABILITATION OF 13 ROADS IN JHAJJAR DISTRICT

The Environmental Assessment is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

Table of Contents

I. INTRODUCTION

A. Background

1. The Project aims to promote growth and balanced development of the whole National Capital Region through providing economic base in the identified major settlements (Metro Centres/Regional Centres) for absorbing economic development impulse of Delhi, efficient transport network, development of physical infrastructure, rational land use pattern, improved environment and quality of life. In line with the objectives of the Regional Plan, the primary objective of this project are to improve quality of life and well-being of urban residents in the National Capital Region (NCR): This will be achieved by way of support to various agencies in the constituent States through NCRPB a line of credit to compliment the ongoing efforts of NCRPB in financing the regional Plan priorities and technical assistance to improve quality of planning, design and management interventions in the region. To address the twin business propositions of the National Capital Region Plannnig Board (NCRPB), – planner of relevance and a strategic financier, - the ADB line of credit comprises of both an investment loan USD 140 million and a TA component of USD 10 million. The projects to be taken up are typical of regions needs –small town water and sanitation, connectivity investments and transport infrastructure which provides multi modal transport linkages.

2. This Initial Environmental Examination (IEE) assesses the environmental impacts due to the proposed improvements to the following roads, 13 road stretches for a total length of 128km in Jajjar and Bahadurgarh districts in Haryana:

- Jharli Mohanbari Approach road (3.235 km
- Jhajjar, Talao, Chhuchakawas road (13.460 km)
- Beri, Rohtak road (8.560 km)
- Badli to Durina via Ladpur Munimpur (11.430 km)
- Badli Pela Sondhi Yakubpur road (9.800 km)
- Sahlawas Amboli Bithla Dhakla SH-22 including Jatwara approach road (16.220 km)
- Subana (SH-22) Sarola Ahri road (6.640 km)
- Patauda (MDR-132 Dhani Saniyan Kahari Machroli(NH-71).(10.080 km)
- Jhajjar Farrukhnagar road (SH15A) Mubarakpur Ismailpur Mundakhera (MDR-136) Badli, Iqbalpur Galibpur upto Distt Border. (11.755 km)
- Badli Iqbalpur road Lohat Delhi Border. (3.765 km)
- Chhuchakwas (MDR-130) Achej Paharipur, Malikpur Safipur road.(12.475 km)
- Godhri Safipur Impota.(6.290 km)
- Gawalision (VT)Kheri Hosdarpur Karodha Raiya (SH-22) Salodha Gijrodh (NH-71) (15.020 km)

3. The IEE specifies measures towards addressal of the impacts. The IEE has been prepared based on a review of sub-project designs; field visits, and secondary data to characterize the environment and identify potential impacts; and consultations with stakeholders. An Environmental management plan (EMP) outlining the specific environmental measures to be adhered to during implementation of the sub-project has been prepared.

B. Compliance to ESMS of NCRPB

4. Recognizing the environmental and social issues that can arise in infrastructure projects, NCRPB has prepared a Draft Environmental and Social Management Systems (ESMS) in line with ADBs safeguard requirements for Financial Intermediaries (FIs). The ESMS provides an overall management system to NCRPB to identify, assess, and mitigate environmental and social issues that are likely to arise in projects financed by NCRPB and implemented by Implementing Agencies (IAs). The ESMS outlines the policies, methods of assessments and procedures that will enable NCRPB to ensure that a project that it funds is developed in accordance with ESMS and is adequately protected from associated risks. IAs will have to comply with the ESMS conditions while submitting their loan application. This IEE has been prepared in line with the ESMS of NCRPB.

C. Purpose of the IEE

5. The proposed components will result in positive environmental impacts. The alignments are proposed along the existing routes and all proposed improvements is envisaged within the available RoW. In case of stretches within settlements, resettlement impacts have been avoided through design of constricted cross-sections and provision of appropriate traffic management measures. Design of the alignment adopting this approach has enabled avoidance of impacts related to land acquisition, and impacts on agriculture lands.

6. Given the magnitude of civil works, there would be typical construction related impacts, and could be mitigated by appropriate mitigation measures and adoption of good construction practices. Further, these will be of limited intensity and of short duration. None of the project interventions as part of these proposed road improvements are proposed within locations in or near sensitive and valuable ecosystems, including protected areas and forests. Therefore, as per the ESMS, the sub-projects are categorized as ‘B’ and an IEE carried out. This IEE provides mitigation measures for impacts related to construction, operation, and maintenance.

D. Environmental Regulatory Compliance

7. The realm of environmental regulations and mandatory requirements for the proposed sub-project is shown in Table 1.The Environmental Impact Assessment (EIA) notification, 2006 by the Ministry of Environment and Forests (MoEF, GoI) specifies the mandatory environmental clearance requirements. Accordingly, all projects and activities are broadly categorized in to two categories - Category A and Category B, based on the spatial extent of potential impacts and potential impacts on human health and natural and man-made resources. This project does not require any environmental clearances under the Environmental Protection Act 1986. However, the project will require consent from Competent Authorities such as the Haryana State Pollution Control Board.

Sub-Component	Applicability of Acts/Guidelines	Compliance Criteria
Roads and highways	Environmental (Protection) Act, 1986 (and as amended subsequently in 2006), and in 2009 The EIA notification, 2006 categorization of projects into category A and B, based on extent of impacts. All new state highway projects and state highway expansion projects in hilly terrain or in ecologically sensitive areas are categorized as category B projects.	According to the notification, the project roads do not fall under either category A or Category B. The roads included are district roads and are not state highways. Therefore, environment clearance is not required for the project. However, permission for felling of road side trees will be required. Consent for Establishment and Consent for Operation from the State Pollution Control Board will be required.

8. The ADB guidelines, stipulate addressing environmental concerns, if any, of a proposed activity in the initial stages of Project preparation. For this, the ADB Guidelines categorizes the proposed components into categories (A, B or C) to determine the level of environmental assessment[1] required to address the potential impacts. None of the project interventions are proposed within locations in or near sensitive and valuable ecosystems, including protected areas and forests. The sub-project has been categorized as B. Accordingly this IEE is prepared to address the potential impacts, in line with the recommended IEE content and structure for Category B projects. The IEE was based mainly on secondary sources of information and field reconnaissance surveys. Stakeholder consultation was an integral part of the IEE.

E. Report Structure

9. This Report contains 8 sections including this introductory section: (i) introduction; (ii) description of project components; (iii) description of the environment; (iv) environmental impacts and mitigation measures; (v) institutional requirements; (vi) public consultation and information disclosure; (vii) finding and recommendation; and (viii) conclusions. An Environmental management plan (EMP) outlining the specific environmental measures to be adhered to during implementation of the sub-project has been prepared.

[1] Level of environmental assessment required for each category of Project, as per ADB's Safeguards Policy Statement, 2009 and Environmental Assessment Guidelines 2003 is as follows: (i) Category A. Sub-project components with potential for significant adverse environmental impacts. An environmental impact assessment (EIA) is required to address significant impacts; (ii) Category B. Sub-project components judged to have some adverse environmental impacts, but of lesser degree and/or significance than those for Category A projects. An initial environmental examination (IEE) is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report. (iii) Category C. Sub-components unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are still reviewed.

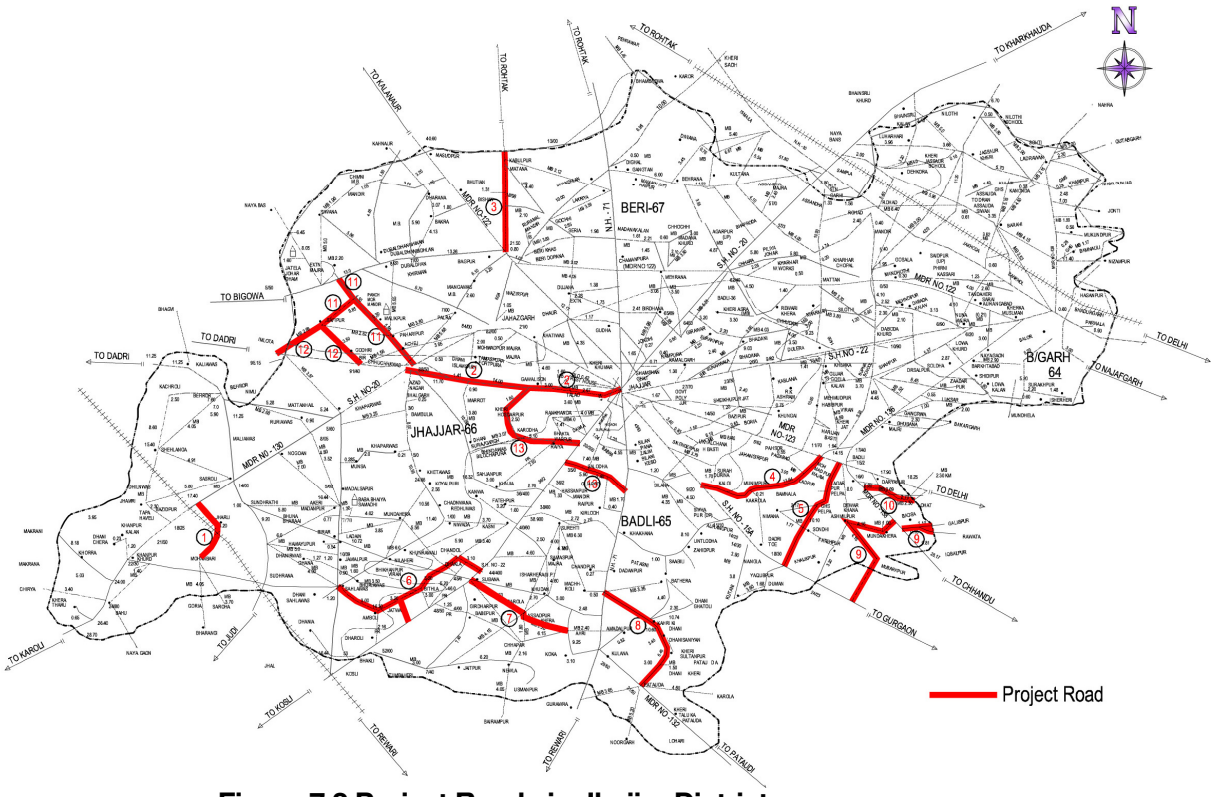
II. DESCRIPTION OF PROJECT COMPONENTS

A. Project Description

10. The thirteen road stretches proposed for rehabilitation and widening is shown in table below. Location map of the project roads is provided in the Figure below.

Table 1: Project Roads – Jhajjar District

Road No.	Name of Work	Length in (km)	Existing width (m)
1.	Jharli Mohanbari Approach road	3.235	3.66
2.	Jhajjar, Talao, Chhuchakawas road	13.460	5.50
3.	Beri, Rohtak road	8.560	5.50
4.	Badli to Durina via Ladpur Munimpur	11.430	5.50
5.	Badli Pela Sondhi Yakubpur road	9.800	5.50
6.	Sahlawas Amboli Bithla Dhakla SH-22 including Jatwara approach road	16.220	3.66
7.	Subana (SH-22) Sarola Ahri road.	6.640	3.66
8.	Patauda (MDR-132 Dhani Saniyan Kahari Machroli(NH-71).	10.080	3.66
9.	Jhajjar Farrukhnagar road (SH15A) Mubarakpur Ismailpur Mundakhera (MDR-136)	11.755	3.66
10.	Badli Iqbalpur road Lohat Delhi Border.	3.765	3.66
11.	Chhuchakwas (MDR-130) Achej Paharipur, Malikpur Safipur road.	12.475	3.66
12.	Godhri Safipur Impota.	6.290	3.66
13.	Gawalision (VT)Kheri Hosdarpur Karodha Raiya (SH-22) Salodha Gijrodh (NH-71)	15.020	3.66
	Total	128.73	



11.

Figure 7.2 Project Roads in Jhajjar District

1. Description of Project Roads

12. Thirteen roads which form part of this package (Package 2) links many villages to major arterial roads of Jhajjar district. The improvement proposal for strengthening and capacity augmentation. Haryana State Road Development Corporation (HSRDC) the executing agency for this project has retained the service of M/s Consulting Engineers Associates for carrying out detailed engineering design report for proposed improvement of 13 roads in Jhajjar district. The data collected as part of the DPR study is generally used for the preparation of this feasibility report.

13. Most of the roads in this package are having single lane width and some have to intermediate lane width with bituminous pavement. The drainage conditions of the project roads especially in the village area are very poor. Concrete pavements are generally provided in the village areas. The horizontal geometry of the project roads are reasonable except at village sections where many sharp curves are observed. As the project area is in flat terrain, smooth vertical profile which meets the required design standards are generally observed on all the roads.

14. The proposed roads of Package 2 are frequently used for transportation of stone metals/ crushed material to Gurgaon and capital city of Delhi for development works, as most of the quarries are located across this area.

15. The project roads run on low to medium embankments except in built-up areas where the road is in level with the adjoining land. Earthen shoulders are also in bad shape and the berm dressing has not been carried out resulting accumulation of rainwater at the edge of the carriageway. The carriageway has thus settled considerably at the edges. In village section, lack of drainage caused the failure of concrete

pavement. Thus, in village section, there is an immediate requirement to construct the roadside drain. There are no protected areas, wildlife sanctuaries or forests in the area.

16. The HSRDC expressed their intention that land acquisition should be used as last resort and hence improvements are limited within the available land width. As such, there is no need to design the road links for high speed as most of the road users have their prime concern to reduce wear and tear to their vehicle by plying over good surface instead of present earthen/ gravel road. Therefore, the scope of geometric improvement can be considered fairly limited for this project except improvement to enhance blind curves which pose a major safety issue. Following paragraphs briefly explain features of each road.

17. Jharli - Mohanbari Approach road: This Road Starts at km 17/40 of MDR130 and terminates at Mohanbari village. The single lane bituminous carriageway is badly damaged. Extensive cracks, pot holes and raveling is noticed for the entire length. The proposed Fuel storage yard for Thermal Power Plant is located along the project road alignment and on commissioning of the yard, Tanker Lorries can use this road to carry fuel to the yard. No properly developed shoulder or defined ROW is noticed in this road. The project road is traversing through plain terrain and in general it is passing through agricultural land. The existing profile is generally at same level with general ground level and hence proper road drainage is absent. The pavement failure can be generally attributed to the poor drainage condition and lack of maintenance. The project road crosses Rewari – Jhajjar broad gauge railway line at Km 1+290. About 1.2km of the initial stretch of the project road has trees on the right side of the project road. Eccentric widening on the left side will save these trees. Project alignment is also passing through built-up locations with narrow RoW.

18. Jhajjar-Talao-Chhuchakawas road: This Road start from Jhajjar town and about 400m of alignment is passing through town area of Jhajjar having commercial and residential buildings on the either side of road. On the way it crosses Jhajjar bypass at Km0+400 and it ends at centre of Chuchhakwas village. One section of Project Road No.13 to Kheri village starts from Km 7+580. At chainage 0+840, construction of a new formation of railway line from Jhajjar to Rohatak is in progress and ROB/level crossing is required on commencement of train service. Big Eucalyptus trees on both the sides of the alignment is observed and about 1300 trees needs to be cut for the proposed widening. Intermediate lane bituminous carriageway with 1 to 1.5m wide earthen shoulder partially covered by vegetation exists all along the project road length. The existing alignment traverse through flat terrain and general land use is agricultural with exception of few builtup stretches. The height of embankment of the project road varies from 1.5 to 2m with earthen drain for about 2km. Existing condition of pavement is very poor with pot holes, alligator cracks and raveling present throughout the project road. Village portion of the alignment is provided with concrete road and it is in fair condition. Project road crosses two irrigation canals. The 5.5 m wide minor bridge on these canal crossings is found in good condition and can be widened.

19. Beri - Rohtak Road: The project road stretch starts at km 35+050 of MDR 122 and ends at Jhajjar district boundary in Ritoli village at Km 8+560. The alignment runs through plain agriculture fields and low lying areas prone to flooding. Flooding is observed at three stretches of about aggregate length of 900m where rising of embankment is required. Earthen shoulder is totally covered by vegetations and bushes. Pot holes, cracks and raveling are observed for the entire length of the alignment and pavement condition is rated as poor. Present avenue plantations are very close to the pavements in some stretches and that needs to be cut for proposed widening. Existing culverts are to be improved and new culverts to be introduced on low lying area where embankment rising is required.

20. Badli to Durina via Ladpur Munimpur: This road starts on the main market place in Badli town at km 17+200 of MDR 123 and ends at km 10+200 of SH15A. Predominantly flexible pavement with 5.5m wide carriageway exist except at builtup stretches where concrete pavement with width varying from 3.5 to 5.5m. In most of the village areas no offset distance is available to the buildings from pavement/drain edge and hence further widening would be near impossible. Shoulder is missing in general and average embankment height of the project road which is generally runs through plain agricultural field is 1.5m. Pavement condition is generally poor which requires immediate strengthening to protect the residual life of existing crust.

21. Badli Pela Sondhi Yakubpur Road: This road also starts on the main market place in Badli town at km 18/9 of MDR123 and ends at km 20/1 of SH15A. Starting stretch of about 350m is passing through builtup section with buildings abutting on the edge of the pavement. Most of the project road is passing through flat terrain and agricultural land. About 700m of the project road is in low lying area where the road to be raised and proper cross drainage structures also to be provided. Towards the end, from Km 7+800 to Km 9+800 has avenue plantation on either side of the road. Pavements condition varies from good to fair except at few bad stretches of about 1500m.

22. Sahlawas Amboli Bithla Dhakla (SH-22) Road: Begins at Sahlawas village and ends at km 14/3 of SH22. Mostly the road runs through agricultural land with the exception of few builtup stretches in village areas. Strengthening and widening work is ongoing in this road and existing pavement has already scarified for the reconstruction of the pavement. It is noticed that domestic waste water is directly discharged into the road and causing stagnation of waste water in the pavement leading to pavement failure. Adequate drainage provision is needed at this stretches to protect the pavement life and hygiene in the area. Throughout the road, the profile is at same level with that of the surrounding agricultural land which used to get water logged and cause major reason for the pavement failure. The road profile in this area to be raised to have sufficient free board of 0.6 to 1m from the perched water table with balancing culverts are essential for protecting the design life of the pavement.

23. Subana (SH-22) Sarola Ahri road: Project road starts at km 18/4 on SH.22 and ends in Km. 7+280 in Ahari village. Initial 400m is running through built up area, where domestic waste water is directly discharged into the road side drain and it often overflows and causing stagnation of waste water into the pavement leading to pavement failure. Most of the stretches are covered by agricultural land except village Sarola where buildings are constructed adjacent to the road edge preventing further widening. Some of the places are affected by water logging and the pavement is in very bad condition. Road stretch from Km 2+600 to end of the road could not be accessed due to ongoing road construction activities.

24. Patauda (MDR-132 Dhani Saniyan Kahari Machroli(NH-71): This road begins at km 31/5 of MDR123 and ends at km 17/2 of NH 71. The alignment traverse largely through plain agricultural land and the average embankment height of the project road is about 1m. Continuous avenue tree plantations on either side of the road are observed on stretches from Km 1+ 800 to 4+800 and Km 7+600 to 10+000. Poor pavements condition is found on the entire length project road. Water stagnation is noticed at Km 7/6 due to poor drainage condition and at present vehicular movement is obstructed.

25. Jhajjar Farrukhnagar road (SH15A), Mubarakpur Ismailpur Mundakhera (MDR-136) Badli, Iqbalpur Galibpur upto Distt Border: This road has two distinct parts in which one part starts at km 26/7 of SH.15A from Jhajjar and ends at MDR 136 and the second part starts from MDR 136 about 1850m away from end of the previous stretch. It has an abandoned railway crossing at Km 0+297. Alignment runs mostly through plain

agricultural land. Pavements are in bad condition throughout except at newly laid stretches of about 600m.

26. Badli Iqbalpur road - Lohat - Delhi Border: This road starts at km 34/2 of MDR 136 and ends at Delhi border. Most of the stretches are passing through agricultural field and avenue tree plantation is seen on intermittent stretches. Existing bituminous pavements are generally in good to fair condition.

27. Chhuchakwas (MDR-130) Achej Paharipur, Malikpur Safipur road: Project Road starts at ChuChhkwas village and ends at km 13/05 of Beri Dadri Road. Here also most part of the project road is passing through agricultural fields except at few villages in between. Many water logged stretched exist in this road which require embankment rising. At village sections, outlet of domestic waste water is discharges directly into the road side drain and often overflows to road and this eventually leads to pavement failure. One metre wide earthen shoulder available on either side of the road and avenue tree plantation is seen on the extreme edge of the shoulder on many stretches. The condition of the existing pavement is very bad with presence of extensive pot holes, raveling and cracks throughout the road. The existing culverts need to be rebuilt for proper drainage in case of rising of road level.

28. Godhri - Safipur: This road starts at km 91/950 of SH.20 – Chuchhakwas – Dadri road and ends at km 97/1 of SH.20 – Chuchhakwas – Dadri road. It runs mainly on agricultural land but at village stretches buildings are very close to the edge of the pavement. Water logged areas in this stretch need embankment rising with adequate provision of cross drainage structures. The pavement condition varies from good to poor.

29. Gawalision (VT)Kheri Hosdarpur Karodha Raiya (SH-22) Salodha Gijrodh (NH-71): This project road has two different parts in which the first part starts at Km 7+580 of Jhajjar-Talao-Chhuchakawas road and ends at Kosli Jhajjar Road and the second part starts at same road where the previous road ends but it is 500m away from the end of previous road and then it ends at km 149/0 of NH 71A Jhajjar - Rewari Road. Most of the road alignment is traversing through agricultural land. At village areas concrete pavements are generally seen. Project alignment is passing through rolling terrain for about 400m from Km 6+200 to 6+600 with valley of about 10m deep on right side and flat terrain on the left side. Construction needs to be limited to available width as many buildings are situated on left side. Construction of new railway line is in progress at Km12+350. About 800m of the road has only earthen road. Culverts along the road needs to be rebuilt wherever embankment rising needed. In general, it is observed that there is no possibility for widening at built-up areas of villages along the road alignment where buildings are adjacent to pavement which in most case is cement concrete pavement. The width varies from 3.5 to 5 m. The drainage situation is poor. In order to improve the living in these settlements, it is essential that bypasses are built to these built-up areas as widening along the existing alignment will required major resettlement effort.

2. Design Standards and parameters

30. The project roads are proposed to be designed as per the standards of Other Districts Roads. Accordingly IRC 73 “Geometric Design Standards for Rural Highways-1980” published by the Indian Road Congress is referred for finalizing project design standards. The design parameters considered for the project road improvements are summarized in the **Table 7.11**.

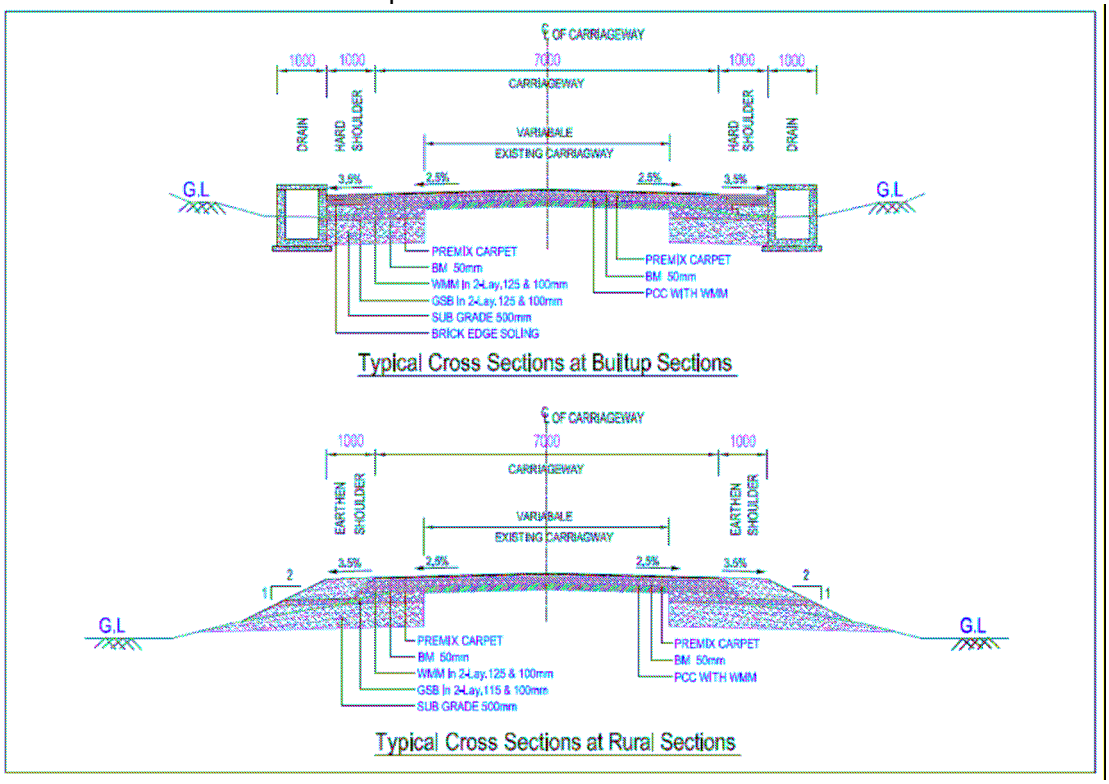
31. Table 7.11 Design Parameters

S. No	Description	IRC Standards		
1	Design speed Plain and Rolling	Max – Min	65 - 50 km/hr	
2	Lane width		3.5 m	
3	Paved shoulder width		1.5 m	
4	Earthen Shoulder		1.0	
5	Road Way Width	Intermediate Lane Two Lane	7.5 m (5.5 m carriageway) 9.0 m	
6	Right of Way		15 m	
7	Cross-slopes	Carriageway Paved shoulder Unpaved shoulder	2.5 % 2.5 % 3.5 %	
8	Maximum super elevation		7.0 %	
9	Minimum horizontal curve radius	For 65 Km/hr For 50 Km/hr	150 m 90 m	
10	Radii beyond which super elevation not required	For 65 Km/hr For 50 Km/hr	750 m 450 m	
11	Super elevation runoff rate	For Plain and rolling For mountainous & steep	<1 in 150 <1 in 60	
12	Transition curves to be used with length of spiral more than or equal to length of super elevation runoff			
13	Extra widening of carriageway on curves	For curve radius >300m 101 to 300m	 Nil 0.6m	
14	Gradient	Ruling Gradient Limiting Gradient Exceptional Gradient	3.3 % 5 % 6.7%	
15	Minimum Length of Vertical Curves / Grade change not requiring vertical curve	Design Speed	min. curve length	max. grade change
		65 km/hr 50 km/hr	40m 30m	0.8% 1.0%
16	Vertical curve 'K' values Crest vertical curve/Sag vertical curve	For design Speed 65 km/hr 50 km/hr	Crest 18.4 8.1	Sag 10 17.4
17	Vertical clearance	Road over road Road over railway Electrical lines H.T.Electrical lines Telecommunication Lines	5.5 m 6.525 m 6.0m (Up to 650 V) 6.5m (More than 650 V) 5.5m (Up to 110 V)	

32. The traffic projection for the design period of 10 years indicate that the projected traffic is within the design service volume of two lane road and therefore two lane road cross section is proposed for the project roads.

B. Design cross-sections

33. Designs are based on IRC codes - and typical cross section is presented In Figure 3. While these are the typical cross-sections, modifications to these have been worked out at locations with RoW constraints, either in rural areas or within built up stretches to minimize land acquisition and resettlement.



C. Implementation Schedule

34. The project is proposed to be implemented over a period of 18 months and as a single construction package. Consultations with the communities along the project roads indicated that the agriculture activities shall be impacted if the construction activities are taken up in the harvesting and sowing periods. The implementation schedule shall be worked out to ensure minimum disruption to the communities, due to the construction activities.

III. Description of the Environment

35. Jhajjar district, carved out of Rohtak district of Haryana, is situated in the southern part of the State of HaryanaThe district lies between 28°22' and 28°49' N latitude and 76°18' and 76°59' E longitude.

A. Physical Environment

1. Topography

36. The Jajjar district forms a part of Indo-Gangatic alluvial plain, with undulating dunes in some parts and small isolated hill in south-western part. Altitude of the district is ranges from 212 m to 276 m above mean sea level (MSL). It slopes from north-east to south-west, with southern part sloping towards north causing saucer like depression in the flat eastern part. Uneven areas suffer from inundation and water logging during monsoon season. In absence of natural drainage, the area is drained by Main Drain No.8 of the district. The canal system of the district drains rain water during rainy season.

37. All the project roads pass through plain terrain with mild gradients. In Jhajjar district most of the area is covered by Quaternary alluvium. The adjoining areas around the project roads mainly consist of flat agricultural fields and brick kilns. In addition to the few scattered water bodies and village ponds existing along the roads, borrowing of earth for brick kilns has resulted in depressions adjoining the identified roads.

38.

2. Climate

39. The climate of the district is sub-tropical, semiarid, continental and monsoon type. Average temperature ranges from 7°C in January to 40.5°C in May and June. January is the coldest month, bringing down the temperature to 3°C; while in summer season it goes up to 47°C. Four seasons of the district are winter from end of November to middle of March, dry summer from April to June, south-west monsoon from July to September and post monsoon season in October and November. Annual average rainfall is 444 mm, with 23 normal rainy days in a year. Average rainfall of 379 mm in monsoon accounts for 85% of the total rainfall. Air is generally dry in the district; while hot desiccating winds (loo), dust-storms are common in summer. Relative humidity ranges from 95% in monsoon to 15% in summer.

3. Soils

40. The soils of the district are fine to medium textured, comprising of sand to sandy loam of yellowish and brown colour in north-eastern part covering Bahadurgarh and Jhajjar blocks, massive beds of pale reddish brown coloured clay in the southern eastern parts. Soil types are Arid Brown (Solonized) and Sierozem. The nitrogen contents are low in the soils of the area. Potassium and phosphorous is medium in Salahwas block whereas high potassium, medium phosphorus occur in the soils of the district. There are sediments consisting of sand, silt, gravel and kankar. The organic Carbon, Nitrogen and Phosphorous are low with medium to high Potash. The sandy to sandy loam soil of Sahlawas and Mattanhail Block are light in colour, deficient in organic carbon, low in Nitrogen and Phosphorous with

medium to high available potash. Poor drainage brackish water and compact kankar layer below root zone in few areas cause more alkalinity and salinity. Soil parameters observed in the district show pH varying from 7.0 to 7.6 (neutral to slightly alkaline), Electrical conductivity (µS/cm) from 832 to 2,154, Organic Carbon – 0.20% (low) to 0.55% (medium), Nitrogen (kg/ha) – 193 to 688 (low to high), available phosphorus was medium to high, while available potassium was low to medium. The micronutrients copper, zinc, and iron were in the range of 0.32 to 0.43 mg/kg, 0.51 to 0.65 mg/kg, and 4.62 to 5.55 mg/kg, respectively, indicating fertile soil. (Source: ADB EIA 42933-IND-SEIA Jhajjar, Jan. 2009)

4. Geology

41. The area forms a part of in Dugan ethic plain ranging from Pleistocene to recent in age Aeolian deposits of sub-recent age cap the plains. The sediments comprise of clay, sand and Kankar mixed in different proportions. No exposure of hard rock farming the basement is seen in the area. With the exception of few small outliers of Alwar quartzite belonging to the Delhi system, there is nothing of geological interest in the district which is almost entirely covered by alluvium.

5. Water systems

42. There is no river in this part of the NCR. However, there are some water bodies adjoining the identified roads, in form of village ponds and lakes. The water table is shallow and within 5 m depths in the northern parts of Jhajjar district. In the remaining parts of the district the water table is between 5 and 20 meters. In Jhajjar district fresh water aquifers of limited thickness are underlain by saline water aquifers, and have limited yielding potential. However, freshwater is available up to a depth of 30 meters in most parts of the district. At present, the water table in Jhajjar District, though is not overexploited, there are areas wherein the water is brackish.

6. Surface Waters

43. Surface water is contributed by canals, tanks and ponds. The district is in Yamuna sub-basin of Ganga basin; and it is drained by artificial Drain No.8 flowing from north to south. Jawahar Lal Nehru feeder and Bhalaut sub-branch are main canals of the district. Jhajjar and Bahadurgarh blocks form part of Sahibi river basin. Area under canal irrigation is about 690 sqkm, out of 1780 sqkm of the total irrigated area.

7. Groundwater

44. In the district ground water occurs under semi confined to unconfined aquifer conditions. The unconfined aquifers are tapped by dug wells whereas the semi confined aquifers are tapped by shallow tube wells. The groundwater gradient is towards the east. The Hydraulic gradient of ground water is very gentle. Ground water movement in the north-western part is from south-east to north-west; in the south-western part it is from south-west to north-east. Depth of water level in the district varies from 0.98 m to 14.37 m below ground level (bgl) during pre-monsoon period and 1.17 m to 14.37 m bgl during post-monsoon period. About 90% of the area fetches ground water at less than 10 m bgl. Ground water near the water bodies yields fresh water. More than 40% of cropped area is irrigated by tube wells. In Salhawas and Jhajjar blocks ground water is in over exploited

category, while Bahadurgarh under critical. Ground water of the district is alkaline in nature with pH ranging from 7.56 to 8.09. Chemical constituents in the ground water are more than the permissible limit, EC (µmho/cm at 25°C) – 1025 to 7520; F (mg/l) – 0.13 to 5.94; Fe – 2.9 mg/l. High chloride content in ground waters of eastern and western parts of the district shows high specific conductivity. The shallow ground water around Kablana in Bahadurgarh block, Kasni Salahwas in Salahwas block is highly mineralized. (Source: Ground water information Booklet, Jhajjar district, Central Ground Water Board, Chandigarh). Ground water quality monitoring in some of the villages of Jhajjar block are given in table.

Parameter	**Measured**	**Indian Standard**	
		Desirable limit	Permissible limit
pH	7.1 – 8.2	6.5 – 8.5	No relaxation
TDS (mg/l)	116 – 10016	500	2000
Total hardness (as CaCO3), mg/l	116-3950	300	600
Alkalinity (mg/l)	75.0-3180.0	200	600
Chloride (mg/l)	34.0-3879.0	250	1000
Calcium (mg/l)	22.0-509.0	75	200
Magnesium (mg/l)	15.0-651.0	30	200
Fluride (mg/l)	0.04-1.02	1.0	1.5

(Source: EIA/EMP Report for 1320 MW Thermal Power Plant at Jhajjar, Haryana. January 2008.)

8. Ambient Air quality

45. Air quality values for suspended particulate matter (SPM) and respirable particulate matter (RPM) observed in Jhajjar block exceeded the standards for residential, rural, and other areas. High SPM and RPM levels occurred due to strong winds that generated dust storms in summer. Levels of sulfur dioxide (SO_2) and NO_x were well within the permissible standards for residential, rural, and other areas.

Parameter	**Observed in Jhajjar in April-June 2007.**	**Standards**
SPM (µg/m^3)	105.0 – 385.0	50 – 100
RPM (µg/m^3)	58.0 – 153.0	--
SO_2	1.0 – 9.3	30 – 120
NO_x	4.0 – 38.0	30 – 120

Source: HPGCL baseline data as collected by MECON Limited for summer season 2007; EIA/EMP Report for 1,320 MW Thermal Power Plant at Jhajjar, Haryana. MECON Limited, 2008.

9. Ambient Noise Levels

46. Average noise levels monitored in the Jhajjar block of the district on rural and residential areas varied from 46.8 to 54.4 dB(A) during the day and 40.1 to 43.6 dB(A) at night, and are within the prescribed limits. Day time noise levels near the Jharli Railway station averaged 60 dB(A), exceeding the limit of 55 dB(A); while night time noise levels averaged 46.1 dB(A), exceeding the limit of 45 dB(A). The monitored noise levels for residential areas were within the prescribed limits.

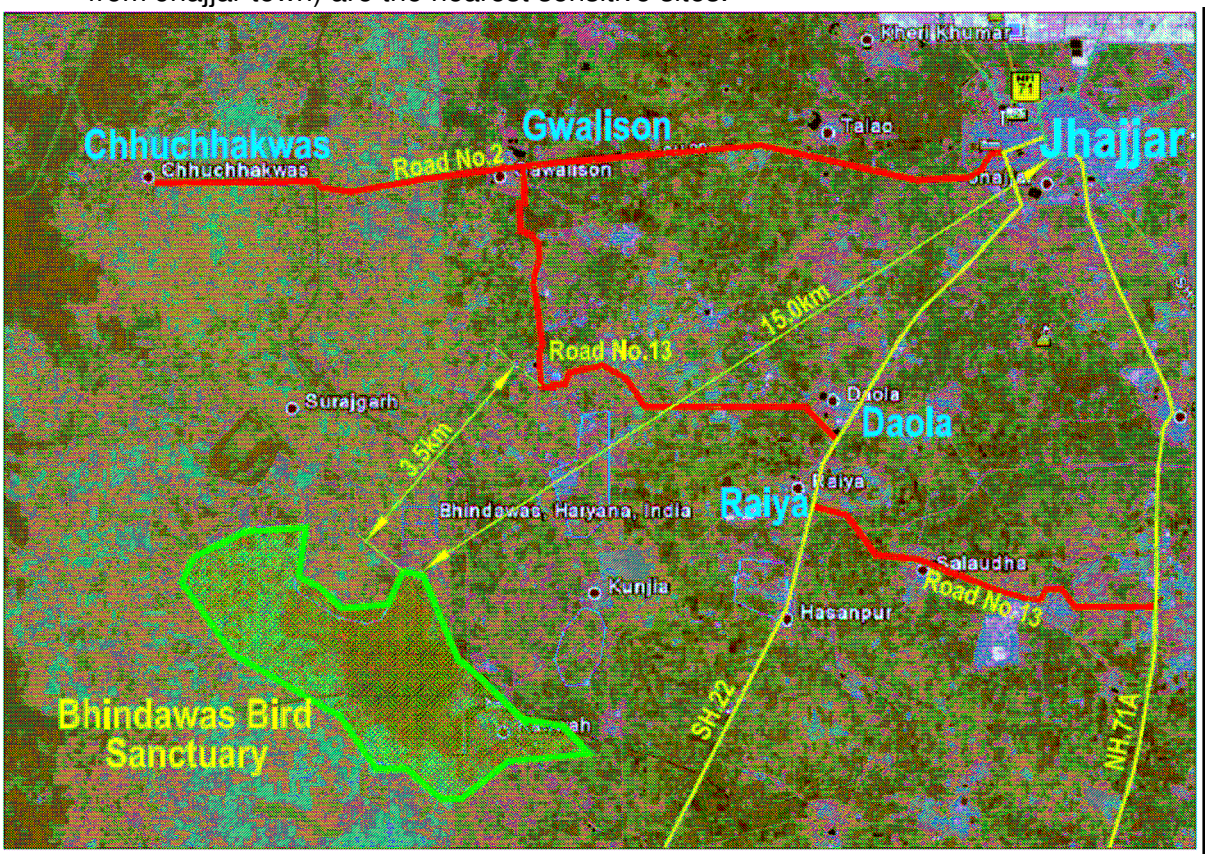
10. Agriculture

47. The main crops grown in the district during rabi season are wheat, gram, barley, mustard, sarson, sugarcane; and in kharif season are cotten, paddy, jawar, bajra, gawar, arhar, till, groundnut, soya bean, moong. Fruits grown in the district include ber, guava, anola and jamun. All major vegetables, spice crops like chillies, garlic, an flowers like chrysanthemum, Gladiolus marigold are cultivated in the district.

11. Ecological Resources

48. There are no reserved or protected forests or areas near and around the project roads. The Bhindawas Bird Sanctuary, situated about 15 km from Jhajjar town and about 3.5 km from Gawalision (VT) Kheri Hosdarpur Karodha Raiya (SH-22) Salodha Gijrodh Road, is the only protected area in the project districts. There are no impacts envisaged on this sanctuary due to the proposed road developments. Given that there are no major protected areas, and that the alluvial plains, and especially the project roads, are largely inhabited, there is hardly any wildlife existing, with exception of nilgai (blue bull). Flora and fauna in the district are not unique. No endangered flora and fauna is noted.

49. Bhindawas Bird Sanctuary (notified as protected area in June 2009) in the north-east (15 km from Jhajjar town) and Sultanpur bird sanctuary in the east (55 km from Jhajjar town) are the nearest sensitive sites.



50. Trees and shrubs noted in the district include shisam (delbergia sisoo), siris (albizzia lebbek), tun (cedrela toona), mulberry (morus), mango (mangifera indca), pipal (ficus religiosa), guler (f. Cunia), bar (f. Indica), lasura (cordial myxa), and shimbal (bombax heptophylla), kikar (acacia arabica), nim (azadirachta indica), jand (prosopis spicigera), nimbar or raunjh (acacia leucopholoea), jamans (zizygium jambolanum), kaindu (diospyrus tomontosa), kaim (stephygone parvifolia), amala (emblica officinalis), rohera (tecoma nudulata), barna (cratoeva religiosa), bel patta (aegle marmelos), amaltas (cassia fistula), dhak (butea frondosa), farash (tamarix orientalis), jhao (tamarix dioica), kharjal (salvadora persica), hingo (balanitos aegyptiaca), hindok, kair (acacia katechu), labul (acacia eburnean), karil (capparis aphylla), jal (pilu), ber or jharpala (zizyphus jujuba), hinsa (capparis horrid), bansa (adhatoda vesica), shimalu (vitex negundo), kanger (pistachio integerrima), mral or marelan (lyceum europaeum), nagpan or prickly pear (cactus indicus), ak (calotropis procera), jawasa (alhagi maurorum), kanda salianasan or yellow-thorned poppy (argemone Mexicana), kandai pasarma (solanum xanthocarpum), dadain (aeschynomene indica), bhuin (anabasis multiflora), khip (orthanthera viminea), kharsana (crotolaria burhia), banna (tamarix gallica) and rerka or bausa (tephrosia purpurea). The grasses are numerous in the district, which include sar (saccharum munja), dub (cynodon dactylon), kans (saccharum spontaneum), gandra or paui or jhuad (anatherum muricatum), makrah, deila, samak (panicum colonum) and bhurat (cenchrum ochinatum).

51. Fauna includes rhesus macaques, squirrels, mongoose, garden lizards, desert cat, caracal, Indian wolf, desert fox, chinkara, blackbuck, Indian pangolin, ratel, black-naped hares, Neelgai and deer. Insects include varieties of butterflies, grass yellow dragonflies, and damselflies.

52. Blue Peafowl, Gray Francolin, Black Francolin, Graylag Goose, Ruddy Shelduck, Bar-headed Goose, Comb Duck, Gadwall, Eurasian Wigeon, Great Cormorant, Common Teal, Northern Pintail, Northern Shoveler, Red vented Bulbul, Common Pochard, Black-rumped Flameback, Common Hoopoe, White-throated Kingfisher, Green Bee-eater, Black Drongo, Pied Cuckoo, Common Hawk Cuckoo, Rose-ringed Parakeet, Spotted Owlet, Blue Rock Pigeon, Great Egret, Purple Swamphen, Great Bittern, Eurasian Collared Dove, Mallard, Crested Lark, Jungle Babbler, Ashy Prinia etc are some of the more common birds found in Bhindawas Birds Sanctuary. The bird species noted in other parts of the district include the Eurasian collared dove, green bee-eaters and common mynas, red-wattled lapwings, rose-ringed parakeets, ashy prinias and Indian peafowl.

12. Fisheries

53. The fish farming in Jhajjar is carried out in village / panchayat ponds on lease. Fishes caught in the district include magur, soil and singhora.

13. Land Use

54. Land use in the district is dominated by agriculture, with net area sown at 85.29% of total geographical area. Growth induced by inclusion of the district in the National Capital Region (NCR) is reflected by increase of land use for residential and industrial purposes. Only a negligible area is under forest cover in this district.

14. Disasters

55. According to the Vulnerability Atlas of India the NCR falls in the,
- High damage risk zone (MSK VIII) for earthquakes
- Very high damage risk zone B (Vb = 50m/s) for wind and cyclone hazards
- Areas liable to floods, which are more site specific and consist of low-lying areas and the flood plain.

56. There are a number of faults and other tectonic features that trigger earthquakes in the NCR. The major ones are, Sohna fault, Aravalli fault, Hidden Moradabad fault in the Indo-Gangetic basin, Sonepat-Delhi-Sohna fault, Junction of Aravalli and Sohna fault, and the Delhi-Haridwar ridge. Earthquakes of intensity lower than four on the Richter scale have originated from 14 epicentres located in the NCR. Two major lineaments, namely Delhi-Hardwar ridge and Delhi- Moradabad fault, pass through the NCR, both having potential of generating earthquakes of magnitude up to 6.5 to 6.7 and normal depth of 30 kms. The NCR lies in the earthquake zone IV, the second highest vulnerable zones with respect to seismic impacts. The proposed design integrates the risks of seismic activities on the project roads, through adoption of the IRC codes and standards.

B. Social and Cultural Resources

1. Demographic profile

57. Total population of Jhajjar district was 880,072 in Census 2001, representing 4.16% of Haryana State. More than seventy five percent of total population lives in rural areas (77.83%) and 22.17% in urban areas (Urbanization of the state-28.9%). Sex-ratio of the district stood at 847 (rural-854, urban-823), when it was 860 for the State. Scheduled castes population is 17.79% (rural-18.32%; urban-15.90%); while no Scheduled Tribe has been notified. Population below 6 years of age in Jhajjar district is 14.97% (rural-15.11%; urban-14.48%), having sex-ratio of 801 (rural-800; urban-804). Total literacy rate (TLR) of the district was 72.37% as against 67.90% of Haryana, in rural areas it was 70.36% (State-63.19%) and in urban 79.42% (State-79.16%). Female literacy rate (FLR) in the district was 59.64% (rural-56.72%; urban-70.10%).

58. Workers participation rate (WPR) of the district was 44.17% of the total population (State-39.62%); it was 47.32% in rural areas (State-42.93%) and 33.10% in urban (State-31.49%). Sex-ratio of the total work force was 588 (rural-683; urban-237), when compared with the State figures of 466 (rural-579; urban-182). Majority of the work force are main workers; 71.06% of the total workers are main workers (in rural-68.33%; in urban-84.74%). 57.17% of the total workers are engaged in cultivation and agricultural sector; it was 66.61% in rural and 9.77% in urban areas.

2. Industries

59. Agriculture is the major activity in the district. Livestock rearing is also an important activity. Bahadurgarh, Najafgarh, Jhajjar, Beri towns of the district has

seen faster growth of industries, due to proximity of these areas to the cities of Delhi and Gurgaon and infrastructure development. Many of the industries in this district are engaged in production of materials used in building and construction sector. Thermal power plants are generating electricity. Infrastructure development fosters growth of tertiary sector industry. Special Economic Zone has been proposed along the National Highway passing through this district for industrial development.

3. Physical Infrastructure Services

60. Health services of the Government is rendered through 100 bedded hospitals in Jhajjar town and Bahadurgarh, 2 community health centres (CHC), 18 primary health centres (PHC), 8 dispensaries and 123 sub-centres.

IV. Identification of Environmental Impacts and Mitigation Measures

A. Land acquisition and resettlement impacts

61. The rehabilitation proposed for 13 road corridors in Jhajjar District does not involve any land acquisition as all improvement works are proposed within the existing Right-of-Way (RoW). However, the project will impact some encroachers who have encroached upon the RoW and some community assets that have been built encroaching upon the RoW. There are no impacts to indigenous peoples.

62. In built-up stretches no widening is proposed in order to minimise involuntary resettlement and it has been proposed to only strengthen the existing road with proper drainage facility. Necessary traffic arrangement measures with proper signage have been proposed to ensure smooth flow of traffic in these constricted stretches.

63. The project will impact 20 households of whom 2 households would lose their place of residence, 7 households will lose a small portion of their house, 4 households will lose their shop, 5 households will lose their compound wall and 2 households their storage/motor room. The project will also impact 15 common property resources that include 4 bus shelters, 1 water tank, 1water tap, 1 community building, 1 tomb and 7 compound walls of common property resources.

64. In line with the Draft+ ESMS of NCRPB, projects funded by NCRPB will require a resettlement plan and/or an indigenous peoples plan commensurate with the significance2 of impact. Rehabilitation of 13 roads in Jhajjar District will come under S-2 category for involuntary resettlement and S-3 category for indigenous peoples as per NCRPB's social categorization.

65. A short resettlement plan has been prepared in line with the Draft ESMS requirements. The summary of resettlement impacts is given in the following table.

Summary of Resettlement Impacts

Impact	Rehabilitation of 13 Roads in Jhajjar District
Permanent Land Acquisition (ha)	0

[2] As per the Draft ESMS projects are categorized based on the significance of involuntary resettlement and impact to indigenous peoples. Involuntary resettlement categories are (a) Category S-1 (Significant Impact): means 200 or more people will experience major impacts, which are defined as (i) being physically displaced from housing, or (ii) losing 10% or more of their productive assets (income generating). Category S-1 projects require a full resettlement plan; (b) Category S-2 (Not Significant). Category S-2 projects include involuntary resettlement impacts that are not deemed significant and require a short resettlement plan; and (c) Involuntary Resettlement Category S-3: There is no involuntary resettlement impacts and hence does not require any action. Indigenous Peoples categories are (a) S-I Significant impacts are those projects that directly or indirectly affect the dignity, human rights, livelihood systems, or culture of indigenous peoples or affect the territories or natural or cultural resources that Indigenous peoples own, use, occupy or claim as their ancestral domain. Category S-1 projects will require a indigenous peoples plan; (b) S-2 Not Significant are projects where the indigenous peoples are the sole or the overwhelming majority of project beneficiaries, and when only positive impacts are identified. Category S-2 projects will require a summary note on IP in project document; and (c) S-3 are projects where no impacts on indigenous peoples are envisaged and hence does not require any action.

Impact	Rehabilitation of 13 Roads in Jhajjar District
Temporary Land Acquisition (ha)	0
Affected Households (AHs)	20 [a]
Affected Persons (APs)	70
Titled APs	0
Non-titled APs (Encroachers)	70
Female-headed AH	0
IP/ST-headed AH	0
BPL AH	4
Affected Structures	20
Affected Trees/Crops	0
Affected Common Property Resources	15
Average Family Size	3.5
Average Household Income	Rs.4,579/- p.m.

[a] *Of the 20 households getting impacted, only 2 households will face significant impact and for 18 households the impact is not significant*

B. Environmental Impacts

66. The assessment for each physical component proposed for this project has been carried out with respect to the potential impacts during the following stages of the project planning and implementation:

- Location impacts. Impacts associated with site selection, including impacts on environment and resettlement or livelihood related impacts on communities
- Design impacts. Impacts arising from project design, including the type of designs, design standards etc
- Construction impacts. Impacts resulting from construction activities including site clearance, earthworks, civil works, etc.
- O&M impacts. Impacts associated with the operation and maintenance of the infrastructure built in the project.

67. The potential impacts occurring from this project have been identified below.

1. Location and design impacts

68. Location impacts are not likely to be significant as there are no major environmentally sensitive areas along the project roads. Impacts on water bodies along the project roads have been minimized through careful design of the alignments to avoid encroachment onto the water bodies. Impacts pertaining to cutting of roadside (including eucalyptus and acacia species) have been unavoidable and will be compensated through compensatory plantation. The impacts pertaining to road safety, especially for stretches in urban areas have been addressed through incorporation of appropriate safety measures in designs.

2. Construction impacts

69. The impacts during the construction stage shall include impacts associated with road construction activities and can be addressed through adoption of good engineering practices and undertaking specific mitigation measures towards minimization of construction impacts on the sensitive receptors and communities in the vicinity of the project roads. The mitigation measures for the various impacts are outlined in the Table xx, and are summarized in the following sub-sections.

70. Drainage: Construction activities in the vicinity of natural drainage channels and water bodies, if drainage is not adequately provided, would cause change in the drainage character of the site and lead to water logging.

71. Soil: Construction of road increases the paved surface and permanent loss of top soil under these civil construction works. Excavation for forming the drains and borrowing also involves loss of top soil as well as scarifying the surface with construction machinery and equipment. Spillage of fuel, lubricants, other oils and chemicals will contaminate the soil in the area.

72. Sourcing of materials. While material such as bitumen may be acquired from local hot-mix plants and aggregate from already identified quarries, procurement of soil will still need to be carried out. Considering that the brick kins have already used the top soil in many areas, sites for the procurement of soil may have to be carefully identified.

73. Water Bodies: Stockpiles of construction debris if left unattended near water bodies as in Jasor Khari will be washed off as runoff into nearby water bodies causing siltation. Spillage of oil, lubricants and other chemicals also mix with the runoff and contaminate the water bodies.

74. Air Pollution: Emission from Construction Vehicles, Equipment and Machinery used for excavation and construction would induce impacts on the air pollution in the construction site as well as on the surrounding settlements. Construction activities generate dust in the surrounding area causing increase in particulate matter. Hot-mix plants installed for road construction will lead to generation of fugitive dust and exhaust emissions. Adequate siting criteria for the hot mix plants to be adopted based on the environmental sensitivity of surrounding land uses.

75. Noise and Vibration Impacts: Generation of noise from construction equipments is a major concern during construction stage. Use of heavy construction machinery in the construction site would generate vibrations and affect the adjacent structures in the settlements. Noise generated during construction is however intermittent and would be of limited duration but would affect the construction workers in case of unprotected prolonged exposure.

76. Material Handling: Storage of Bitumen and other hazardous material if stored near drainage channels would induce hazardous situations to the environment from possibility of leaching into ground and flow as runoff. Spillage of debris and construction material to surface water bodies may lead to surface water quality deterioration. Stockpiling of materials along the edge of the road will obstruct the drainage and restrict the free movement of vehicles.

77. Safety during construction: Appropriate measures during construction shall be worked out to address safety issues during construction. Prolonged exposure of workers to consistently high decibel noise levels above 90 dB(A) also induces hearing losses. Similarly, prolonged exposure of the workers to dusty environment of the construction site induces respiratory problems and loss of man days. Traffic diversions have to be notified sufficiently in advance and where necessary temporary diversions have to be provided for safe crossing of the traffic.

78. Site clearance and Restoration of Construction Camps: Post construction clearance if not adequate, would create unsightly conditions and affect aesthetics of the

area. Campsites if not removed usually become a refuge for unscrupulous activities and sometimes develop as another settlement putting strain on the resources. Sanitary pits may cause contamination of surface and ground water.

3. Operational impacts

79. Impacts on environmental conditions associated with the operation stage of the project are identified to be due to increased of air and noise pollution from the increased vehicular traffic along the route. The proposed improvements and safety provisions, in settlement areas would reduce accidents and congestion and result in more public and private transport vehicles also plying in the area. Improved drainage provision within the settlements shall ensure avoidance of water logging and poor drainage conditions along the project roads.

V. Environmental Management Plan

80. Potential environmental impacts identified in the IEE due to implementation of the project components are to be minimized or avoided through appropriate mitigation and avoidance measures mentioned in Table 5. The agencies that are responsible for implementing the measures that are required to be undertaken have been identified.

Table 2: Environmental Impacts and mitigation measures

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
1	Location Impacts				
1.1	Land acquisition and resettlement impacts required due to widening of roads at certain locations, where required.	Permanent	Major	Land acquisition impacts to be minimal as the proposed strengthening of the road will be restricted to the existing RoW.	HSRDC & Design Consultants
2	Design and pre-construction Impacts				
2.1	Alterations of drainage pattern of the site	Permanent	Major	Design of cross drainage structures would be carried out so as to avoid alteration of drainage pattern. Design would be done considering 50 year return flood level to avoid overtopping of the roads and maintain natural drainage	HSRDC, Design Consultants
2.2	Damage to roadside trees	Permanent	Severe	If removal of any tree is unavoidable, obtain tree clearance approval from Forest Department. Identify each tree along the proposed route and adequately mark each tree within proposed construction areas. For trees not proposed to be cut, but within the construction area, take all precautions to protect trees not impacted from any damage including placement of tree guards	HSRDC & Design Consultants
2.3	Impact on cultural properties, shrines, temples etc	Permanent	Temporary	The designs shall be worked out to minimize impacts on cultural properties, shrines etc. All precautionary measures to address impacts on structures including protection measures required shall be provided in the designs.	HSRDC & Design Consultants
3	Pre-construction Activities by Contractor				
3.1	Construction Camps – Location, Selection, Design and Layout	Temporary	Moderate	The construction camps will be located at least 500m away from habitations at identified sites.	Contractor / Management Consultant
3.2	Drinking water availability and water arrangement	Temporary	Severe	The contractor will be responsible for arrangement of water in every workplace at suitable and easily accessible place for the whole construction period. Sufficient supply of cold potable water (as per IS: 10500) to be provided and maintained. If the drinking water is obtained from an intermittent public water supply then, storage tanks will be provided.	Contractor / Management Consultant
	Establishment of construction camps and / or hot mix plants, if required	Temporary	Moderate	Obtain the consent-to-establish and consent-to-operate from the Pollution Control Board Adhere to the air pollution and water pollution standards prescribed.	HSRDC, PMC & Contractors
3.3	Identification of disposal sites	Permanent	Major	Location of disposal sites will be finalized based on consultations with the Engineer. The Engineer will certify these are not located within designated environmentally sensitive areas and confirm that: Disposal of the material does not impact natural	Contractor / Management Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				drainage courses No endangered / rare flora is impacted by such material Settlements are located at least 1000m away from the site	
3.4	Quarry Operations	Permanent	Major	It has to be ensured that materials are obtained from licensed quarries having environmental clearance. Quality and legality to be examined by the Contractor and copies of environmental clearances for these needs to be submitted prior to sourcing of material.	Contractor / Management Consultant
3.5	Batching Plants	Temporary	Moderate	Batching plants will be located sufficiently away from habitation, where possible such plants will be located at least 1000m away from the nearest habitation. The contractor will obtain the consent to operate the plants from the SPCB.	Contractor / Management Consultant
4	Construction Impacts				
4.1	Improper stockpiling of construction materials can cause impacts starting from obstruction of drainage, disturbance/ safety hazard to local population, traffic blockage, etc.	Temporary	Moderate	Due consideration will be given for material storage and construction sites such that it doesn't cause any hindrance to daily traffic movement. Stockpiles will be covered to protect from dust and erosion.	Contractor / Management Consultant
4.2	Quarry / Borrow pits Operations	Permanent	Moderate	Adequate safety precautions will be ensured during transportation of quarry material from quarries to the construction site. Vehicles transporting the material will be covered to prevent spillage. Operations to be undertaken by the contractor as per the direction and satisfaction of the Engineer.	Contractor / Management Consultant
4.3	Stripping, stocking and preservation of top soil	Permanent	Moderate	The topsoil from borrow areas, areas of cutting and areas to be permanently covered will be stripped to a specified depth of 150mm and stored in stockpiles. The stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and the height of the pile is to be restricted to 2m. Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur. The stockpiles will be covered with gunny bags or tarpaulin. It will be ensured by the contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles. Such stockpiled topsoil will be returned to cover the disturbed area and cut slopes.	Contractor / Management Consultant
4.4	Soil Erosion	Permanent	Moderate	At the outfall of each culvert, erosion prevention measure, will be undertaken, as per the direction and satisfaction of the Engineer The work will consist of measures as per design, or as directed by the Engineer to control soil erosion, sedimentation and water pollution. All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earthwork or other items of work.	Contractor / Management Consultant
4.5	Compaction of Soil	Tempo	Minor	To minimize soil compaction construction vehicle.	Contractor /

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
		rary		machinery and equipment will move or be stationed in designated area (RoW or CoI, haul roads as applicable) only. The haul roads for construction materials will be routed to avoid agricultural areas	Management Consultant
4.6	Blasting	Permanent	Moderate	Except as may be provided in the contract or ordered or authorized by the Engineer, the Contractor will not use explosives. Where the use of explosives is so provided or ordered or authorized, the Contractor will comply with the requirements of the following Sub-Clauses of MoRTH 302 besides the law of the land as applicable. The Contractor will at all times take every possible precaution and will comply with appropriate laws and regulations relating to the importation, handling, transportation, storage and use of explosives and will, at all times when engaged in blasting operations, post sufficient warning flagmen, to the full satisfaction of the Engineer. The Contractor will at all times make full liaison with and inform well in advance and obtain such permission as is required from all Government Authorities, public bodies and private parties whomsoever concerned or affected or likely to be concerned or affected by blasting operations. Blasting will be carried out only with permission of the Engineer. All the statutory laws, regulations, rules etc., pertaining to acquisition, transport, storage, handling and use of explosives will be strictly followed. all directions at least 10 minutes before the blasting.	Contractor / Management Consultant
4.8	Loss of Access	Temporary	Moderate	The contractor will provide safe and convenient passage for vehicles, pedestrians and livestock to and from side roads and property access connecting the project road. Construction activities that will affect the use of side roads and existing access to individual properties will not be undertaken without providing adequate access. The construction works will not interfere with the convenience of the public or the access to, use and occupation of public or private roads, or any other access to properties, whether public or private.	Contractor / Management Consultant
4.9	Soil and Water Pollution due to fuel and lubricants, construction waste	Temporary	Moderate	The fuel storage and vehicle cleaning area will be stationed such that runoff from the site does not drain into the water body. Oil interceptor will be provided at construction vehicle parking area, vehicle repair area and workshops ensuring that all wastewater flows into the interceptor prior to its discharge.	Contractor / Management Consultant
4.10	Siltation of Rivers and streams due to spillage of construction wastes	Temporary	Moderate	Silt fencing to be provided at all water bodies near construction sites to prevent sediments from the construction site to enter into the watercourses. The number of units of silt fencing to be installed is to be decided by the engineer. Discharge standards promulgated under the	Contractor / Management Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				Environmental Protection Act, 1986 for surface water bodies will be strictly adhered to. No disposal of construction wastes will be carried out into the river.	
4.11	Generation of Dust	Temporary	Moderate	The contractor will take every precaution to reduce the levels of dust at construction sites to the satisfaction of the Engineer. All earthwork to be protected/covered in a manner acceptable to the satisfaction of the engineer to minimise dust generation.	Contractor / Management Consultant
4.12	Emissions from batching plants	Temporary	Moderate	Batching plants will be located atleast 500m away from environmentally sensitive areas as Reserved Forests / National Parks and sensitive receptors i.e., hospital and college. The exhaust gases will comply with the requirements of the relevant current emission control legislation. All operations at plants will be undertaken in accordance with all current rules and regulations protecting the environment. Monitoring of air and noise parameters will be as per monitoring plan	Contractor / Management Consultant
4.13	Emission from Construction Vehicles, Equipment and Machinery	Temporary	Moderate	The discharge standards promulgated under the Environmental Protection Act, 1986 will be strictly adhered to. All vehicles, equipment and machinery used for construction will conform to the relevant Bureau of Indian Standard (BIS) norms. All vehicles, equipments and machinery used for construction will be regularly maintained to ensure that pollution emission levels comply with the relevant requirements of SPCB and the Engineer. 'PUC' certificates will be obtained regularly for all vehicles used for the project. Copies will be submitted regularly to the Engineer.	Contractor / Management Consultant
4.14	Dust Pollution from Crushers	Temporary	Minor	All crushers will obtain siting clearance from SPCB or only those crushers that have already have obtained license from SPCB will be used.	Contractor / Management Consultant
4.15	Noise from construction Equipments	Temporary	Moderate	Maintenance of vehicles, equipment and machinery will be regular and to the satisfaction of the Engineer, to keep noise from these at a minimum. All vehicles and equipment used for construction will be fitted with exhaust silencers. During routine servicing operations, the effectiveness of exhaust silencers will be checked and if found to be defective will be replaced. Noise limits for construction equipment used in this project (measured at one metre from the edge of the equipment in free field) such as compactors, rollers, front loaders, concrete mixers, cranes (moveable), vibrators and saws will not exceed 75 dB (A), as specified in the Environment (Protection) Rules, 1986 Notwithstanding any other conditions of contract, noise level from any item of plant(s) must comply with the relevant legislation for levels of noise emission.	Contractor / Management Consultant
4.16	Traffic Control and Safety	Temporary	Moderate	The contractor will take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades,	Contractor / Management Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				including signs, marking flags, lights and flagmen as per Engineer's direction and satisfaction, for the information and protection of traffic approaching or passing through the section under improvement. Before taking up any construction, detailed Traffic Control Plans will be prepared and submitted to the Engineer for approval, 5 days prior to commencement of work on any section of road. The traffic control plans shall contain details of arrangements for construction under traffic and details of traffic arrangement after cessation of work each day. The Contractor will ensure that the running surface is always maintained in good condition, particularly during the monsoon so that no disruption to traffic flow occurs	
4.17	Road furniture	Temporary	Minor	All roadside structures / furniture, protection, intersections, traffic islands, rotaries, facilities and amenities etc. will be constructed as per engineering design and to the satisfaction of the engineer. Similarly restoration of bus shelters including bus bays complete with seating arrangement, other infrastructure etc. will be carried out as per design and to the satisfaction of the engineer.	Contractor / Management Consultant
4.18	Material Handling at Site	Temporary	Minor	All workers employed on mixing asphaltic material, cement, concrete etc., will be provided with protective footwear and protective goggles. Workers, who are engaged in welding works, would be provided with welder's protective eye-shields. Workers engaged in stone breaking activities will be provided with protective goggles and clothing and will be seated at sufficiently safe intervals. The use of any toxic chemical will be strictly in accordance with the manufacturer's instructions.	Contractor / Management Consultant
4.19	Disposal of Bituminous wastes / Construction Waste / Debris / Cut Material	Temporary	Moderate	The bituminous waste generated will be reused in road construction based on its suitability of reuse to the maximum extent possible. Safe disposal of the extraneous material will be ensured in the pre-identified disposal locations. In no case, any construction waste will be disposed around the project road indiscriminately. Cut material generated because of construction will be utilized for as filling material. Remaining material if any will be disposed off safely at the disposal sites.	Contractor / Management Consultant
4.20	Safety Measures During Construction	Temporary	Moderate	All relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996 will be adhered to. Adequate safety measures for workers during handling of materials at site will be taken up. The contractor has to comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress. The Personal Protective Equipment for workers on	Contractor / Management Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				the project will conform to respective IS codes.	
4.21	Risk caused by Force Majure	Temporary	Minor	All reasonable precaution will be taken to prevent danger of the workers and the public from fire, flood, drowning, etc. All necessary steps will be taken for prompt first aid treatment of all injuries likely to be sustained during the course of work.	Contractor / Management Consultant
4.22	Malaria Risk	Temporary	Minor	The Contractor will, at his own expense, conform to all anti-malaria instructions given to him by the Engineer.	Contractor / Management Consultant
4.23	First Aid	Temporary	Minor	At every workplace, a readily available first aid unit including an adequate supply of sterilized dressing material and appliances will be provided as per the Factory Rules. Suitable transport will be provided to facilitate transfer of injured or ill person(s) to the nearest hospital. At every workplace and construction camp, equipment and nursing staff will be provided.	Contractor / Management Consultant
4.24	Hygiene	Temporary	Minor	All latrines will be provided with dry-earth system (receptacles), which will be cleaned at least four times daily and at least twice during working hours and kept in a strict sanitary condition. Receptacles will be tarred inside and outside at least once a year. All temporary accommodation must be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing. Garbage bins must be provided in the camps and regularly emptied and the garbage disposed off in a hygienic manner. Adequate health care is to be provided for the work force. Unless otherwise arranged for by the local sanitary authority, the local medical health or municipal authorities will make arrangement for disposal of excreta. On completion of the works, all such temporary structures will be cleared away, all rubbish burnt, excreta tank and other disposal pits or trenches filled in and effectively sealed off and the outline site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the engineer.	Contractor / Management Consultant
4.25	Archaeological Property chance find	Temporary	Minor	The contractor will take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing and will, immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out the Engineer's instructions for dealing with the same, awaiting which all work will be stopped 100 m all directions from the site of discovery. The Engineer will seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence work on the site.	Contractor / Management Consultant
4.26	Clearing of Construction of Camps & Restoration	Temporary	Major	Contractor to prepare site restoration plans for approval by the Engineer. The plan is to be implemented by the contractor prior to demobilization.	Contractor / Management Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				On completion of the works, all temporary structures will be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the Engineer.	
5	O&M Impacts				
5.1	Environmental Conditions	Permanent	Moderate	The HSRDC will undertake seasonal monitoring of air, water, noise and soil quality through an approved monitoring agency. The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored will be as per the Monitoring Plan prepared.	HSRDC
	Survival of trees planted	Permanent	Moderate	Proper care shall be taken to increase survival rate of saplings like regular watering, pruning, provision of tree guards, manure for better nourishment, etc. including timely replacement of perished saplings.	HSRDC
5.2	Increased air and noise pollution due to increased traffic using the improved roads	Permanent	Moderate	Smooth and better road surface will reduce generation of noise. Provision of vegetative barriers where ever possible. Other measures such as improved transport fuel quality, more stringent environmental norms, installation of no horn signages at educational institutes and at hospitals	HSRDC
5.3	Drainage of roadsides	Permanent	Moderate	To ensure efficient flow of surface water and to prevent water logging along the side of the roads adequate size and number of cross-drainage structures and longitudinal drains are provided in the design. These will be adequately maintained by cleaning and avoiding clogging of openings.	HSRDC
5.4	Traffic and Accident Safety	Permanent Risk	Major	Depending on the level of Congestion and traffic hazards, traffic management plans will be prepared. Traffic control measures including speed limits to be enforced strictly. Road control width to be enforced. Local government bodies and development authorities will be encouraged to control building development along the highway.	HSRDC

VI. Institutional Requirements

A. Institutional Arrangements

81. Haryana State Roads Development Corporation (HSRDC), as the Implementing Agency (IA) will undertake all actions for the implementation of the project. HSRDC will have one specialist identified to overseeing the implementation of the EMP, and will be outsourced. An Environmental Officer (consultant) shall be inducted within the HSRDC to address the environmental impacts due to the project. The identified officer should be a Civil Engineer specializing in Environment or a related field with experience in the management of infrastructure projects. S/he should be similar with Indian legislation and the implementation of multi/bilateral loan projects.

82. Roles and Responsibilities

- Review of IEE and other environment documents based upon ADB's Environmental Assessment Guidelines, or other multilateral or bilateral agency guidelines, as required.
- Liaise and obtain clearances from with required state and central departments for clearances and compliance to regulations.
- Monitor and oversee the implementation of the Environmental Management Plan
- Ensure inclusion of EMP in contractor's ToRs.
- Oversee implementation and monitor compliance to the EMP
- Undertaken required interactions with civil society groups and community for projects under implementation
- Ensure inclusion of public concerns and grievances in EMP and project implementation. Undertake dialogue with affected communities, as required.
- Review environmental performance of project through periodical environmental monitoring reviews. Where additional environmental safeguards are identified incorporate them in project design, construction or implementation or other follow-up actions, as required.
- Provide required support for the management of environmental concerns in the implementation of the project
- Develop, review and plan and implement training and capacity building for contractors and consultants involved in the project

83. A consultant shall be hired for supervising construction activities. This agency will need an officer identified for overseeing the implementation of the EMP. The roles and responsibilities of this individual will be,

- Work closely with Corporation's environmental specialist for the implementation of EMP and ensure compliance to environmental safeguards, support its implementation
- Work with Corporation's environmental specialist for getting environmental clearances for the project
- Review of EMP implementation and advice the Corporation's environmental specialist on the implementation status
- Review any changes in project design, identify environmental safeguards if required and work with the Corporation's environmental specialist to reflect identified safeguards in EMP
- Ensure all identified systems – safety, accident management and control, waste are in place, functioning and implementing personnel have adequate training to implement actions

- Ensure that all safety gear for workers and on the project location are in place
- Consultation with stakeholders and inclusion of their concerns in project implementation
- Incorporate additional environmental safeguards as required during project implementation.

B. Environmental Monitoring Plan

84. Prior to developing a monitoring plan there is a need for the development of a baseline for some activities. This would help with the monitoring activities. The baseline is described below.

1. Development of a baseline

85. Prior to developing a monitoring plan there is a need for the development of a baseline for some activities. This would help with the monitoring activities. The baseline is described below.

Sl. No.	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Responsibility	Cost estimates INR
1	Air Quality	Pre construction	SPM and RSPM, NOx, CO	Ten – two on each of the roads – for all 5 roads, near habitations.	In morning, rush hours or time of high traffic and late evening	DPR consultant	4000/sample
2	Noise	Pre construction	Decibels	Ten – two on each of the roads – for all 5 roads, near habitations.	n morning, rush hours or time of high traffic and late evening	DPR consultants	1000/sample
3	Water quality	Pre construction	Surface water quality	Sample waterbodies along with construction activities will be undertaken	Once, prior to construction	DPR consultants	2000/ sample
4	Site for quarries and borrow pits	Pre construction	The site situation – for rehabilitation, photographs	All sites identified for quarries, borrow pits, waste and construction labour camps and offices	Once prior to construction	DPR consultants/ agency identified to supervise construction	30,000 lump sum
5	Vegetation removal	Pre construction	Vegetative survey to identify type and amount of vegetation that requires to be replaced	Along paths that are to be cleared off trees for construction activities	Once prior to construction	DPR consultants	300000 lump sum

2. Monitoring Actions

Sl. No.	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Responsibility	Cost estimates INR
1	Air Quality	Construction	SPM and RSPM, NOx, CO	Ten – two on each of the roads – for all 5 roads, near habitations.	Thrice annually	Contractor	4000/sample
2	Noise	Construction	Decibels	Ten – two on each of the roads – for all 5 roads, near habitations.	Thrice annually	Contractor	1000/sample
3	Water quality	Construction	Surface water quality	Sample waterbodies along with construction activities will be undertaken	Thrice annually	Contractor	2000/sample
4	Site for quarries and borrow	Construction	After construction activity over – if rehabilitated	All quarries, borrow pits, waste and construction labour camps and offices	Once prior to construction	Contractor	40,000 total

Sl. No.	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Responsibility	Cost estimates INR
	pits			sites			
5	Tree/vegetation plantation	Construction	Ensure all vegetation/tree replacement activity undertaken	Based upon discussions with local community and Forest Department	During construction	Contractor	40,000 total
6	Air Quality at Residential area	Operation	RPM, SPM, SO_2, NO_x, CO and Hydrocarbons	At ten locations, especially around sensitive receptors and settlements	Once in a season (except monsoons) for the first 3 years of operation	Contractor	100000 per year
7	Noise Levels at residential and silence zone	Operation	Equivalent Day & Night Time Noise Levels	At ten locations, especially around sensitive receptors and settlements	Once in a season for the first 3 years of operation	Contractor	50000 per year

C. Training & Capacity Building

86. The training programme will start with a Sensitization Workshop for officials of HSRDC and also the Contractor's personnel. Typical modules that would be present for the training session would be as follows:

- Sensitization
- Introduction to Environment Considerations in Urban Development Projects
- Review of IEE and Integration into Design
- Improved Co-ordination within Nodal Departments, on special issues, if any.
- Role during construction
- Monitoring & Reporting System

87. The proposed training program along with the frequency of sessions is presented in the table below.

Program	Description	Participants	Form of Training	Duration	Trainer / Agency
Introduction and sensitisation to environment issues	Sensitisation on environmental concerns ▪ Environmental impacts of road's projects ▪ GoI environmental regulations ▪ ADB/multilateral/bilateral environmental regulations ▪ Coordination between departments for implementation of environmental safeguards	Senior department engineers HSRDC officials responsible for implementing project and office in-charge of implementing environmental safeguards	Workshop	Half day workshop	External Consultants/ NCRPB

Program	Description	Participants	Form of Training	Duration	Trainer / Agency
EMP implement ation	Implementation of environment EMP ▪ Identification of environment impacts ▪ Monitoring and reporting for EMP ▪ Public interactions and consultations ▪ Identification of various government	Department head at Haryana PWD B&R and HSRDC in-charge of the project, officer in-chare of project implementation, identified officer in-charge of implementing EMP	Lectures and field visit		External Consultants/ NCRPB
EMP implement ation	Implementation of EMP ▪ Identification of environment impacts ▪ Monitoring and reporting for EMP ▪ Public interactions and consultations	Officer in charge of implementing this project activities at HSRDC, officer implementing EMP for agency/contractors	Lecture and field visit	One day session	External Consultants/ NCRPB
Implement ation of EMP	Reporting and coordination ▪ Coordination for consents and with various departments ▪ Identification of environmental impacts ▪ Monitoring formats filling and review of impacts	Officer in charge of implementing this project activities, officer implementing EMP for agency	Lecture and interactive session	Half day session	External Consultants/ NCRPB
Recurring training programm es	Management of Environmental impacts Identification of Environmental impacts Environmental regulations Environmental monitoring and review	Department head at Haryana PWD B&R and HSRDC in-charge of the project, officer in-chare of project implementation, identified officer in-charge of implementing EMP	Lecture and interactive session	One day session	External Consultants/ NCRPB

D. Environmental Budget

88. As part of good engineering practices in the project, there have been several measures as erosion prevention, rehabilitation of borrow areas, safety, signage, provision of temporary drains, etc the costs for which will be included in the design costs. Therefore, these items of costs have not been included in the IEE budget. Only those

items not covered under budgets for construction and RP are costed in the IEE budget. The IEE costs include mitigation, monitoring and capacity building costs. The summary budget for the environmental management costs for the project is presented in the following table.

Sl. No.	Particulars	Stages	Unit	Total number	Rate (INR)	Cost (INR)
A.	Mitigation Measures					
1	Management of dust and sand during construction activities – suppression etc	Construction	Lump sum			200,000
2	Ensuring occupational safety for workers at camps and construction sites	Construction	Lump sum			400,000
	Sub -Total (A)					600,000
B.	Monitoring Measures					
	Water quality	Pre-Construction / Construction	Per sample	30	4000	120,000
	Air	Pre-Construction / Construction	Per sample	60	2000	120,000
	Noise	Pre-Construction / Construction	Per sample	60	1000	60,000
	Burrow pits sites etc	Pre-Construction / Construction	Lump sum			70,000
	Vegetation/tree survey and monitoring implementation of tree plantation	Pre-construction / construction	Lump sum			70,000
	Sub -Total (B)					440,000
C	Capacity Building					
2	Sensitisation, awareness	Pre-construction	Lump sum			472000
3	Monitoring and management	Construction	Lump sum			187000
	Sub-Total (C)					659000
	Total (A+B+C), INR					1,303,000

VII. Public Consultation and Information Disclosure

A. Process of Consultation Followed

89. During the preparation of the project, consultations with stakeholders were held on environmental issues with HSRDC, communities along the project roads and affected persons. The general impression from the consultations was that all stakeholders were glad for the development as it would result in a better environment in the area, ease traffic and reduce travel time, and will also result in fewer accidents. Summary of the consultations undertaken is given in Table below.

Table 3: Summary of Consultations

S.No.	Place	Date	Number of participants	Participants	Issues discussed
1	Ladpur	28 November, 2009	5	Residents and local business owners	The residents identified the need for better and broader roads. The quality of the roads needed improvement Pavements and proper shoulders for roads must be considered as a part of the design
2	Lalpur village	28 November, 2009	8	Residents and passersby	Participants discussed the need for better roads – which were well surfaced. Speed breakers, shoulders along the roads and trees were also suggested. Speed breakers were specifically requested for in front of schools to ensure the safety of children.
3	Munimpur village	28 November, 2009	10	Residents and users of road	The need for better roads and proper surfacing of roads was suggested. A proper covered drain and culverts were suggested by the participants. Speed breakers at points where village roads met the main roads, animal crossings and along schools were suggested. Some concerns were raised about the possibility of residences in the vicinity of the roads being broken for the broadening and strengthening activities for the roads. It was confirmed that the impacts to private properties is not envisaged and all construction and improvement activities will be carried out within the available RoW.
4	Village Dhania	28 November, 2009	7	Farmers	All acknowledged the need for better roads – broader and also of better quality which did not get damaged fast.
	Along road	28 November, 2009	4	Farmers	The consultation also highlighted that often the roads were damaged due to water logging and therefore appropriate design considerations must be ensured so that the roads

S.No.	Place	Date	Number of participants	Participants	Issues discussed
					last longer. There was also a suggestion for speed breakers to ensure the safety of all persons and animals using the road
	Kheri Sultan	28 November, 2009	10	Road users and residents	The need for better roads, speed breakers and shoulders was suggested The residents also said that they had to use their own vehicles to access markets due to the lack of public transport, which was because of the lack of proper roads The residents also wanted speed breakers to reduce speed of vehicles and ensure the safety of children and animals who also crossed the road. Summer months were suggested for all construction activities.

B. Framework for continued public participation

90. A grievance redressal cell will be set up within the HSRDC to register grievances of the people regarding technical, social and environmental aspects. This participatory process will ensure that all views of the people are adequately reviewed and suitably incorporated in the design and implementation process. Further, to ensure an effective disclosure of the project proposals to the stakeholders and the communities in the vicinity of the project locations, an extensive project awareness campaigns will be carried out.

91. For the benefit of the community the Summary IEE will be translated in the local language and made available at: (i) Office of the HSRDC Division at Jhajjar, (ii) Office of the District Commissioners, Jhajjar and Bahadurgarh districts. These copies will be made available free of cost to any person seeking information on the same. Hard copies of the IEE will be available in the HSRDC office as well as the local library, and accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. On demand, the person seeking information can obtain a hard copy of the complete IEE document at the cost of photocopy from the office of the Divisional office of the HSRDC at Jhajjar, on a written request and payment for the same. Electronic version of the IEE will be placed in the official website of the HSRDC and the website of ADB after approval of the documents by Government and ADB. The HSRDC will issue notification on the disclosure mechanism in local newspapers, ahead of the initiation of implementation of the project, providing information on the project, as well as the start dates etc. The notice will be issued in local newspapers one month ahead of the implementation works. This will create awareness of the project implementation among the public. Posters designed to mass campaign the basic tenets of the IEE will be distributed to libraries in different localities that will be generating mass awareness.

VIII. Findings and Recommendations

92. It is to be noted that as per the statutory requirements of Government of India (Environmental Impact Assessment Notification, September 2006, and its subsequent amendment 2009) Environmental Impact Assessments are not required for the proposed road improvements. The proposed development does not fall either in Category A or in Category B as per GoI EIA requirements. Right of Way (RoW) has been kept minimum to minimize environmental impacts associated with widening of the roads. The significance of the environmental impacts will be more due to the construction related impacts than any impacts associated with areas of rich environmental sensitivity. It is to be noted that the resultant potential impacts from these proposals can be offset through provision of proven mitigation measures during the design and adoption of good engineering practices during construction and implementation. EMP prepared to this affect addresses these potential impacts through appropriate mitigation, management and monitoring measures.

93. The effective implementation of the measures proposed will be ensured through the building up of capacity towards environmental management within the HSRDC supplemented with the technical expertise of an Environmental Specialist as part of the Management Consultants. Further, the environmental monitoring plans prepared as part of the EMP will provide adequate opportunities towards course correction to address any residual impacts during construction or operation stages.

IX. Conclusions

94. The project will have a number of benefits such as – reduced time taken to travel on the roads with reduced congestion, reduced accidents on the road and smoother flow of traffic. Also, considering the low levels of environmental impacts expected it will not require any major mitigation. The proposed components should proceed through to design and implementation, subject to mitigation measures and monitoring programs as per EMP for potential impacts identified in the IEE. These will be updated and detailed during detailed design stage, and based on above recommendations. It may be emphasized that the present IEE, which identifies potential impacts and EMP which presents appropriate mitigation measures, is sufficient enough to safeguard the environment. There are no significant adverse impacts, which are irreversible or may lead to considerable loss/destruction of environment, envisaged. All the impacts are generic and have proven mitigation measures to minimize/mitigate the same.

X. Appendix 1: REA Checklist

ROADS AND HIGHWAYS

Instructions:

- This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
- Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: Jhajjar Roads, Haryana. NCRPB, India

Sector Division:

SCREENING QUESTIONS	Yes	No	REMARKS
A. PROJECT SITING IS THE PROJECT AREA ADJACENT TO OR WITHIN ANY OF THE FOLLOWING ENVIRONMENTALLY SENSITIVE AREAS?			There are no special or protected areas.
▪ CULTURAL HERITAGE SITE	☐	■	

SCREENING QUESTIONS	Yes	No	REMARKS
▪ PROTECTED AREA	☐	■	
▪ WETLAND	☐	■	
▪ MANGROVE	☐	■	
▪ ESTUARINE	☐	■	
▪ BUFFER ZONE OF PROTECTED AREA	☐	■	
▪ SPECIAL AREA FOR PROTECTING BIODIVERSITY	☐	■	
B. POTENTIAL ENVIRONMENTAL IMPACTS WILL THE PROJECT CAUSE…			
▪ encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries?	☐	■	
▪ encroachment on precious ecology (e.g. sensitive or protected areas)?	☐	■	
▪ alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?	■	☐	The topography of the area is relatively flat. There are a few village ponds near the roads as they pass through the villages. Surface runoff during rains could lead to stagnating water in the fields adjoining the roads or in the villages. The project design therefore needs to include culverts and road side drainage.
▪ deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	■	☐	Concerns may exist as there will be a need to get labour from outside, therefore requiring labour camps.
▪ increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?	■	☐	

SCREENING QUESTIONS	Yes	No	REMARKS
▪ noise and vibration due to blasting and other civil works? ▪ dislocation or involuntary resettlement of people	■	□	Increasing noise and vibrations during construction and civil works shall be an impact, to address which, construction timing therefore will need to ensure that disruptions are low.
▪ other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress?	■	□	Road widening may result in some areas encroached upon requiring acquiring.
▪ hazardous driving conditions where construction interferes with pre-existing roads?	□	■	
▪ poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?	■	□	Local population do not work as construction labour, therefore workers from outside will be specially brought for the construction of the road, requiring labour camps and associated amenities.
▪ creation of temporary breeding habitats for mosquito vectors of disease?	■	□	At labour camps, quarries and borrow pits the possibility of temporary breeding habitats for mosquito vectors is possible.
▪ dislocation and compulsory resettlement of people living in right-of-way?	□	■	There is nobody living in right of way. The identified land is mainly for agricultural
▪ accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials and loss of life?	□	■	
▪ increased noise and air pollution resulting from traffic volume?	□	■	
▪ increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?	□	■	

95. Altitude of the district is ranges from 212 m to 276 m above mean sea level (MSL). Bhadurgarh rail head at north-eastern side connects the district to Delhi and Rohtak; while Jharli railhead at south-western end connects it with Riwari and Bhiwani. Delhi is the nearest airport. It is located in Seismic Zone IV.

96. The Haryana Development and Regulation of Urban Areas Act, 1972 regulates the use of land in order to prevent ill-planned and haphazard urbanization in or around towns in the State of Haryana. The Punjab scheduled roads and controlled area restriction of unregulated development Act, 1963 regulates erection or re-erection of any building or make or extend any excavation or lay out any means of access to a road within one hundred meters of either side of the road reservation of a bye-pass or within thirty meters on either side of the road reservation of any scheduled road not being bye-pass or expressway.

Environmental Assessment Document

G. DEVELOPMENT OF MULTI-MODEL TRANSIT CENTRE AT SARAI KALE KHAN

The Environmental Assessment is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

Table of Contents

I. INTRODUCTION

A. Background

1. The Project aims to promote growth and balanced development of the whole National Capital Region through providing economic base in the identified major settlements (Metro Centres/Regional Centres) for absorbing economic development impulse of Delhi, efficient transport network, development of physical infrastructure, rational land use pattern, improved environment and quality of life. In line with the objectives of the Regional Plan, the primary objective of this project is to improve quality of life and well-being of urban residents in the National Capital Region (NCR). This will be achieved by way of support to various agencies in the constituent States through NCRPB a line of credit to compliment the ongoing efforts of NCRPB in financing the regional Plan priorities and technical assistance to improve quality of planning, design and management interventions in the region. To address the twin business propositions of the National Capital Region Planning Board (NCRPB), – planner of relevance and a strategic financier, - the ADB line of credit comprises of an investment loan USD 140 million and a TA component of USD 10 million. The projects to be taken up are typical of regions needs –small town water and sanitation, connectivity investments and transport infrastructure which provides multi modal transport linkages.

2. This Initial Environmental Examination (IEE) assesses the environmental impacts due to the proposed Sarai Kale Khan (SKK) MMTC sub-project at the existing ISBT location at Sarai Kale Khan in South East Delhi. It is one of the three ISBTs in Delhi, the other two being at – Kashmiri Gate and Anand Vihar. The MMTC planned will facilitate seamless integration of the inter-city and intra city transit options in the area and largely benefit inter modal transfer by transit passengers with reduced transfer times and improved comfort. This will also have significant impact on the utilization of transit services as transfer between local bus to metro rail and interstate bus/train services become very convenient. The metro station is under construction and will be operational in 2010. The proposed MMTC will thus provide significant community benefits and will have a positive impact on the transport movement in the area. The IEE specifies measures towards addressal of the impacts. The IEE has been prepared based on a review of sub-project designs; field visits, and secondary data to characterize the environment and identify potential impacts; and consultations with stakeholders. An Environmental management plan (EMP) outlining the specific environmental measures to be adhered to during implementation of the sub-project has been prepared.

B. Compliance to ESMS of NCRPB

3. Recognizing the environmental and social issues that can arise in infrastructure projects, NCRPB has prepared a Draft Environmental and Social Management Systems (ESMS) in line with ADBs safeguard requirements for Financial Intermediaries (FIs). The ESMS provides an overall management system to NCRPB to identify, assess, and mitigate environmental and social issues that are likely to arise in projects financed by NCRPB and implemented by Implementing Agencies (IAs). The ESMS outlines the policies, methods of assessments and procedures that will enable NCRPB to ensure that a project that it funds is developed in accordance with ESMS and is adequately protected from associated risks. IAs will have to comply with the ESMS conditions while submitting their loan application. This IEE has been prepared in line with the ESMS of NCRPB.

C. Purpose of the IEE

4. The proposed SKK MMTC subproject will result in positive environmental impacts. None of the project interventions as part of these proposed road improvements are proposed within locations in or near sensitive and valuable ecosystems, including protected areas and forests. The sub-project components have been accommodated within the available lands within the existing terminal and no fresh land acquisition is required. Given the magnitude of civil works, there would be typical construction related

impacts, and could be mitigated by appropriate mitigation measures and adoption of good construction practices. Further, these will be of limited intensity and of short duration. Therefore, as per the ESMS, the sub-projects are categorized as 'B' and an IEE carried out. This IEE provides mitigation measures for impacts related to construction, operation, and maintenance.

D. Environmental Regulatory Compliance

5. The EIA Notification of the MoEF, September 2006, does not warrant environmental clearance from the MoEF for MMTC projects. Further the general conditions specifying triggers[1] for Category A projects are not envisaged due to the proposed sub-project. The project requires clearance from the Delhi Pollution Control Committee under Clause 3 of the Environmental Protection Act, 1986. Although the project plans to reuse its sewage after cleaning, for any sewage that may be discharged the MMTC will require clearance under the Water Pollution (Control and Regulation) Act, 1974 amended till 1988. The ADB guidelines, stipulate addressing environmental concerns, if any, of a proposed activity in the initial stages of Project preparation. For this, the ADB Guidelines categorizes the proposed components into categories (A, B or C) to determine the level of environmental assessment[2] required to address the potential impacts. The sub-project has been categorized as B. None of the project interventions are proposed within locations in or near sensitive and valuable ecosystems, including protected areas and forests. The sub-project has been categorized as B. Accordingly this IEE is prepared to address the potential impacts. The IEE was based mainly on secondary sources of information and field reconnaissance surveys. Stakeholder consultation was an integral part of the IEE

E. Report Structure

6. This Report contains 8 sections including this introductory section: (i) introduction; (ii) description of project components; (iii) description of the environment; (iv) environmental impacts and mitigation measures; (v) institutional requirements; (vi) public consultation and information disclosure; (vii) finding and recommendation; and (viii) conclusions. An EMP outlining the specific environmental measures during implementation of the sub-project has been prepared.

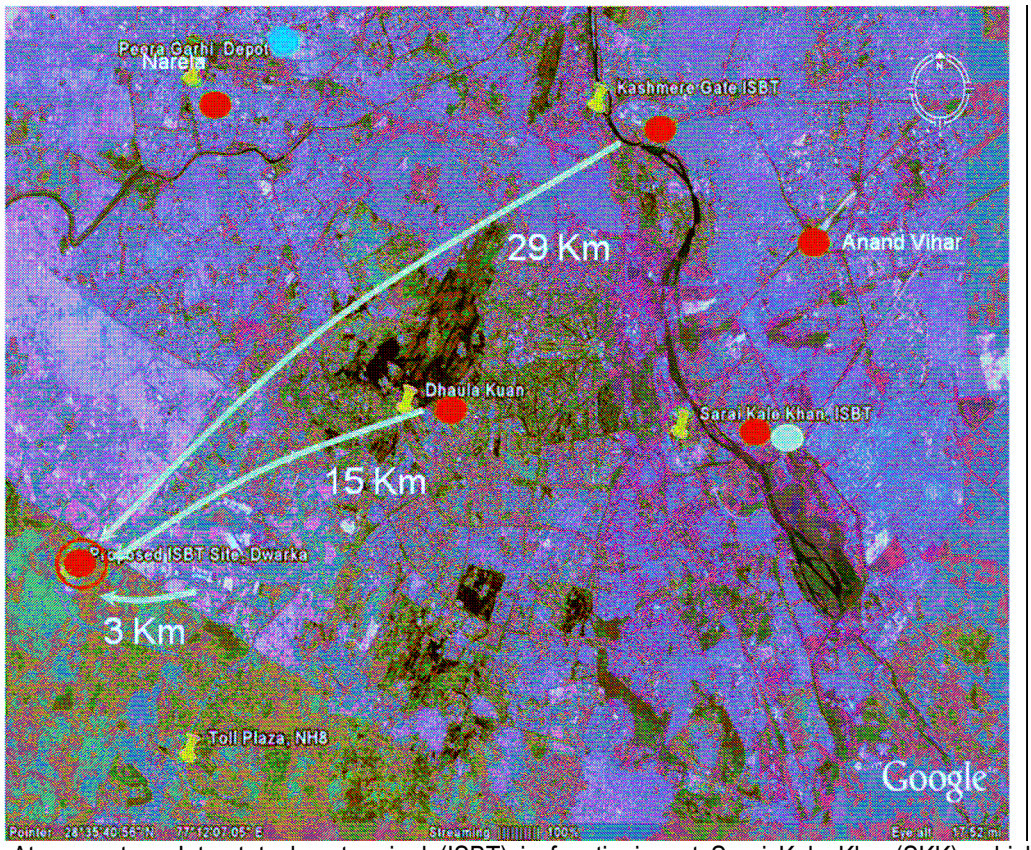
II. DESCRIPTION OF PROJECT COMPONENTS

A. Project Background

7. The project selection is based on the transport policy of Delhi. The proposed MMTC at Sarai Kale Khan is planned to meet the policy objective of integrated Transit Terminal development. The proposed Multi-Modal Transit Centre (MMTC) will play an important role in facilitating integration of bus, rail and private/IPT modes for travel within the region as well as in facilitating more modal shift to public transport within Delhi and thus contributing to reducing the road congestion.

1 Any project or activity specified in Category 'B' will be treated as Category A, if located in whole or in part within 10 km from the boundary of: (i) Protected Areas notified under the Wild Life (Protection) Act, 1972, (ii) Critically Polluted areas as notified by the Central Pollution Control Board from time to time, (iii) Notified Eco-sensitive areas, (iv) inter-State boundaries and international boundaries.

2 Level of environmental assessment required for each category of Project, as per ADB's Environmental Assessment Guidelines 2003 is as follows: (i) Category A. Sub-project components with potential for significant adverse environmental impacts. An environmental impact assessment (EIA) is required to address significant impacts; (ii) Category B. Sub-project components judged to have some adverse environmental impacts, but of lesser degree and/or significance than those for Category A projects. An initial environmental examination (IEE) is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report. (iii) Category C. Sub-components unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are still reviewed.



8. At present an Interstate bus terminal (ISBT) is functioning at Sarai Kale Khan(SKK), which is focusing on the requirement of interstate bus traffic and associated transport needs. The local buses also operate from the terminal providing access to the ISBT from various parts of the city. The ISBT at SKK provides an ideal location with Hazrat Nizamudin railway station located adjacent to SKK. A proper integration of all three modes of public transport which are servicing from the area viz. Interstate bus, Local bus and Rail is essential to achieve objective to have an integrated multi-modal network of public transport systems. The phased development plan for Delhi Metro includes extension of metro rail to connect SKK and hence MMTC should have proper integration with Metro also.

9. The MMTC planned at SKK will facilitate seamless integration of the inter-city and intra city transit options in the area and largely benefit inter modal transfer by transit passengers with reduced transfer times and improved comfort. This will also have significant impact on the utilization of transit services as transfer between local bus to interstate bus/train services become very convenient. The passengers will also benefit from the pedestrian friendly design for the MMTC, which will improve the safety of passengers and improved environmental comfort. The proposed MMTC will thus provide significant community benefits and will have a positive impact on the transport movement in the area.

10. The objective of the development of MMTC at Sarai Kale Khan is as listed below:

- To redevelop the existing ISBT as Multi Modal Transit Center (MMTC).
- To decongest the internal city roads by restricting the flow of inter-state buses.
- To facilitate an effective multi-modal changeover by integrating the existing ISBT with the Nizamudeen Railway Station and the planned Metro rail station.
- To provide a state-of-the-art Multi Modal Transit Center that is user friendly, catering to varied passengers' comfort, pedestrian-friendly, ecologically sustainable, handicapped-friendly, and aided with facilities as per best international practices.

B. Project Components

11. ISBT at Sarai Kale Khan is located on the inner ring road near South Delhi localities. Sarai Kale Khan is a major bus terminus in Delhi. It is adjacent to the Hazrat Nizamuddin Railway Station situated in South of Delhi. Sarai Kale Khan is the terminus for most buses heading for towns south of Delhi. It is also a DTC bus depot for many Moffusil bus routes. The existing bus terminal at the site is a temporary structure with 85 bus bays. There are no separate areas for alighting and boarding of passengers. The terminal is in shortage of passenger facilities and parking for private vehicles. There is also no segregation of pedestrian and vehicular circulation which is a major conflict.

12. The 10.5 hectares of site is a linear patch along 45 m wide inner ring road, which connects ITO on north and Ashram Chowk on south. The project site has an irregular shape and is part of the Public / Semi-Public Use designated by the existing land use plan of the city, in the Master Plan of Delhi, 2021. The entire site is sloping north to South along the length of the site. It has close proximity with river Yamuna on its eastern side and a deep drain/ Nallah very close on its Southern side. Parts of the site are covered with Debris/ filled-up dumps/ bushes/ grass etc. The variation in level of site and ring road is approximately 2 meter.

13. The broad project components are:

- ISBT – Bus bays with boarding and alighting platforms segregated, Idle bays, Washing/Workshop facilities for buses, Booking/Ticketing counters
- Local Bus Terminal - Bus bays with boarding and alighting platforms segregated.
- Admin/Terminal office – Includes ISBT administration, CCTV security room, maintenance room and office DTC and other roadways.
- Offices for DTTDC and other tour operators.
- Pedestrian Connectivity to Railway Station.
- Passenger facilities include dormitories, waiting hall, toilet, cloak room and restaurant/cafeteria.
- Parking facilities include for Auto, taxi, rickshaw and private vehicles
- Commercial retail and office space
- Hotel (space allocated for development by private sector)

14. In addition to the project components mentioned above, the following aspects have been detailed in the DPR.

- **Overall Aesthetics Design guidelines** to regulate the total development character and aesthetic have been formulated based on the following aspects:
  a. Urban Design Guidelines (massing and volume, external furniture, signage)
  b. Architectural Façade (Elements, Material, Colour)
  c. Functional Essentials (Value Added Services during Implementation Phase)
  d. Site Development Specifications (surface finishes & colours, plantation heights) and External Area Maintenance. This will be for planned horticulture and landscape, footpaths, railings, curbs and handicap access points
- **Maintenance Procedures** (i) Maintenance and repairs of the facility and all its components, including roads, pavements, building, toll plaza and allied works. (ii) Setting performance standards to ensure management of complete operations & maintenance activity of minimum acceptable level. (iii) Laying down timetable for Periodic inspections, Ensure minimal disruption of the operations of the bus terminal during maintenance phase.
- **Guidelines for Cleanliness** will cover the following i) trash collection / maintenance of receptacles (bins), ii) drinking fountains – cleaning a purification, iii) cleaning of building and furniture, floors and carpets, iv) cleaning of toilets and public conveniences

- **Infrastructural support** at the MMTC will include an assured water supply, assured and adequacy of power, sewerage management including a sewerage treatment plant, drainage and telecommunication facilities
- **Energy efficiency and resource management.** The design is planned for minimising the use of energy, recycle and reuse the waste products to the maximum possible extent, and rainwater harvesting.

15. The broad project components are:

16. **Inter-State Bus Terminal - (State and Private):** There will be both inter state and local bus terminals at the bus terminal. This will include i) bus bays, ii) boarding / aligning platforms, iii) washing and workshop areas, and iv) booking / ticketing counters. Inter State Bus Terminal facility may be located within the downtown core, as a central passenger collection and distribution node, or on the periphery of the core, as a rapid transit feeder station.

17. **Local Bus Terminal.** Will include i) bus bays and ii) boarding / aligning platforms. This terminal design is to be based on three main stages related to handling of bus movement - alighting (of passengers), parking (idle) and boarding (of passengers), and their intermediary functions and the smooth and safe movement of passenger to and from modes of city transport. The essential passenger facilities- information, ticketing, waiting & public conveniences value added amenities are to be located within the same building.

18. **Workshop:** The workshop area provided is to be connected with the idle parking to facilitate access of the buses in the bay to the maintenance and servicing facilities. There will also be access to the workshop from the boarding and alighting bus bays if required. The workshop area will not be visible to the general public. The services provided at the workshop will include i) repair bays ii) washing bays, iii) spare parts storage, iv) workers amenity and v) administrative office.

19. **Administrative or Terminal Office.** The major functions of this office will be i) ISBT administration, ii) CCTV security room, iii) maintenance office, iv) offices for DTC and roadways. There will also be space for other offices such as DTTDC, Tour Operators.

20. **Passenger facilities.** This will mainly consist of i) dormitories, ii) waiting hall, iii) toilet, iv) cloak room, v) restaurants/ cafeterias. There will also be a number of other passenger and visitor amenities. These will include, tea, coffee, fruit and juice shops. Sweet shops, ice-cream parlours, food and snack shops and restaurants, general merchants, department stores, stationery and newspaper shops, chemists and pharmacists, hair dressers and toilets. Also available will be offices of banks, financial companies, ATMs, yatri-nivas (boarding and lodging), doctors and dentists, insurance company offices and business centres.

21. **Hotel Space.** A hotel is also planned for the area and land has already been earmarked for it.

22. **Parking Facility:** These will be available for three-wheelers taxies, rickshaw, and personal vehicles. A "park and ride" terminals with open, paved parking spaces is also planned at the MMTC.

1. Traffic Circulation

23. Traffic circulation is designed with conflict free unidirectional movement. Grade separated entry from south side is provided for buses. The common exit for both local and interstate buses is provided on the right side and hence avoiding the entry and exit conflict and ensure smooth flow of traffic inside. The entry of right turning buses from the inner ring road to the ISBT is not marked in the circulation plan. This aspect need further review and provision for right turn entry from the inner ring road to the ISBT is to be made. Separate parking space for taxi and auto is provided with unidirectional circulation. The suggested circulation ensures searching the all the parking lots in single circulation. However exit point to main road is very close to junction and this needs revision. Drop area is proposed on the terminal side of the Taxi/Auto parking area, which ensures easy pedestrian access from drop off area to terminal building.

2. Pedestrian Network

24. Integrated pedestrian network is designed to ensure safe and efficient movement of pedestrians. The proposed pedestrian network consists of foot over bridges, escalators, lift, travelators etc. Travelators are proposed for the pedestrians to connect the ISBT to Nizamuddin railway station in the future. But no

pedestrian connection is proposed to metro station as the plan of metro is not finalized yet. The travelators proposed as part of the project is not included in the project cost as this facility falling outside the ISBT land. Installation of the travelators will improve the integration and significantly increase the utilization of the integrated system. All the bus bays are provided on the sides of a single multi faced terminal building and movement of passengers from one bay to another is possible without climbing foot over bridges.

3. Land Distribution

25. Area statement for proposed SKK MMTC is given in Table below.

Table 4.7 Area Statement

A	Land for ISBT owned by Transport Dept of GNCTD	10.2 Hector
B	Land area under Metro	1 Hector
C	Balance are for ISBT (A-B)	9.2 Hector
D	Ground Coverage 25% of (C)	2.273 Hector As / DDA NOC
E	Permissible (FAR = 100)	92000 SqM
F	FAR for ISBT including operational Structures 70% of D	64400 SqM
G	FAR for Hotel 30% of D	27600 SqM
Proposed Covered Area Statement for ISBT		
1	Basement	54241.258
2	Floors (Ground and I to 8)	34787 SqM
3	Achieved Ground Coverage (10515.321/64400*100) Excluding basement	16.328%
4	Achieved FAR (34787/64400*100)	54%

26. The space utilization is within the permissible limits.

C. Implementation Schedule

27. The project is planned for a 15 months period. This time frame includes the demolition of the existing site, process, detailed engineering design and the construction activity. There is to be no land acquisition for the MMTC.

III. Description of the Environment

A. Physical Environment

4. Topography

28. The NCT of Delhi forms part of the Indo-Gangetic plains. The Delhi ridge under Aravalli range and Yamuna floodplains are the prominent geographical features of this area. Sarai Kale Khan lies to the west of Yamuna river. The area is part of the Yamuna Basin comprising the newer alluvium made up of fine to medium, sands, silts, gravel, clay and canker. The alluvial sediments are underlined by hard formations of Delhi system of rock. Altitude is 239 Mtrs above sea level. Delhi's rock formations consist mainly of the Quaternary newer and older alluvium, pre Cambrian Alwar Quartzite. There are also a number of faults in and around the city and are responsible for some of the earthquakes that are felt in the city.

5. Climate

29. The area has a semi-arid climate with high variation between summer and winter temperatures. The temperature varies from 40oC in summer to around 4oC in winter. Summer is from early April to October, with the monsoon season in between. Winter starts in November and peaks in January. The annual mean temperature is 25°C (77 °F); monthly mean temperatures range from 14 °C to 33 °C (58 °F to 92 °F). The average annual rainfall is approximately 714 mm (28.1 inches) with average of 39 rainy days in a year, most of which is during the monsoons in July and August.

6. Water systems

30. The River Yamuna flows from the North to the South dividing the city – with East Delhi lying on one side of the river and the rest of the city on the other side. Apart from River Yamuna there are also a number of drains and water bodies. These include both natural (like the Najafgarh jheel) and manmade systems. The major sources of water in the city are ground water from the city's aquifers and the river bed and the rivers originating from the Himalayans. Groundwater sources in Delhi are assessed to be 292 mcm / year, though the quality of the water varies with some areas having a high TDS, fluorides and nitrates.

31. Sarai Kale Khan is situated near the western banks of River Yamuna. The water quality of river Yamuna in the stream nearer to Sarai Kale Khan reflects the impact of wastewater discharge. The seasonal variations indicate that in Delhi stretch the DO level was always below the prescribed limit during both the seasons. Water quality parameters recorded at River Yamuna at Nizamuddin Bridge during November 2008 and June 2009 are given in Table.

32.

Parameters	Standard	During November 2008	During August 2009
pH	6.0 – 9.0	7.6	7.5
TSS (mg/l)		96	26
COD (mg/l)		64	76
BOD (mg/l)	Less than 3.0	22	23
DO (mg/l)	Less than 4.0	Nil	0.5
TC (MPN/100 ml)	5000	260000	--
NH_3 (mg/l)		--	0.2

33. Source: Delhi Pollution Control Committee, NCT of Delhi.

7. Ambient Air quality

Air quality data observed near Sarai Kale Khan during the period from December 2007 to June 2009 show the information given in table.

Parameter	NAAQ Standards	Measured in New Friends Colony near Sarai Kale Khan	Minimum – Maximum for Delhi	Average for Delhi
NO_x (µg/m3)	80	29 – 87	8.7 – 204	40 – 94
SPM (µg/m3)	200	276 – 508	236 – 938	334 – 560
RSPM (µg/m3)	100	160 – 250	136 – 485	192 – 313
CO (µg/m3)		788 – 2100	500 – 2200	835 – 1273
SO_2 (µg/m3)	80	5.0 – 18.7	5.0 – 38.2	7.0 – 24.0

Source: Department of Environment, GNCTD

8. Ambient Noise Levels

Noise levels in Delhi exceed permissible levels in all areas except industrial areas. The average ambient noise levels are in excess of the prescribed standards during day time. The average ambient noise levels are in excess of the prescribed standards during day time. Ambient Noise Levels observed at New Friends colony near Sarai Kale Khan and average for NCT of Delhi is given in table.

Location (in dB)	June(2008)		July (2008)		August (2008)		Sep. (2008)		Oct. (2008)		Nov. (2008)		Dec. (2008)		Jan. (2009)	
	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N

New Friends Colony	60.1	53.2	62.8	56.5	62.2	53.5	62.9	55.2	63.1	55.6	61.8	56.7	61.3	56.2	59.2	53.5
Minimum for Delhi	57.4	48.7	57.1	50.8	56.6	48.3	59.0	51.8	61.1	50.7	59.0	47.1	56.8	47.7	57.6	47.5
Maximum for Delhi	69.0	62.2	65.9	62.3	67.2	62.6	65.0	59.2	64.0	57.4	63.8	60.5	64.4	61.2	64.0	60.8
Average	61.5	55.0	61.0	54.8	61.4	54.5	62.7	55.5	62.4	54.4	61.7	54.5	60.9	54.1	60.5	60.5

(D – Day; N – Night) Source: Department of Environment, NCT of Delhi.

9. Ecological Resources

34. Delhi is relatively rich in wildlife with 2 biodiversity parks, the Aravalli and the Yamuna Biodiversity Parks. There is also the Asola Bhatti Wildlife Sanctuary in Delhi, on the Southern Ridge. Biodiversity significance of Ridge lies in its merger with IndoGangetic plains. There are no wild life sanctuaries/parks nearby project area. Neither any rare nor endangered species have been recorded in the area.

35. Of the total geographical area of 1483 sq km, 7.5% of the area is covered by forests. The total area under Reserved Forests (RF) in Delhi is 78 sq kms and under Protected Forests (PF) 7 sq kms, which is a total of 85 sq kms under protected and reserved forests in the city. Vegetation of Delhi is typical tropical thorn forests and open scrub as found in arid and semi arid areas. Some of the major tree species found in Delhi are Acacias like A. nilotica, A. leucophloea, A. catechu, A. modesta, Butea monosperma (Dhak), Cassia fistula (Amaltas), Salvadora persica. Also found is Anogeissus latifolia and alien species like Prosopis juliflora. Shrubs include capparis sepiaria, C.deciduas, Zizyphus aenoplia, croton sparaiflorus. Herbaceous flora is Calotropis procera, Withania somnifera, Achyranthes aspera, Tridax, Alysicarpus vaginalis, peistrophe bicalyculata. Main grasses in the area are Cenchrus ciliaris, Aristida, Eragrostis poaeioides, Saccharum spontaneum. There are 14 City Forests in Delhi identified by the Delhi Forest Department. The details of these are given below.

S No	Name of City Forest	Area (ha)	District	Remarks
1	Nasirpur City Forest	28	South-West	Fully developed with basic amenities/ facilities for visitors
2	Alipur City Forest	16.80	North	Fully developed with basic amenities/ facilities for visitors
3	Hauz Rani City Forest	28.80	South	Fully developed with basic amenities/ facilities for visitors
4	Mitraon City Forest	40.00	South – West	Protected Forest, maintained as a city forest
5	Sultanpur City Forest	48.00	North – West	Protected Forest
6	Ghumenhera City Forest	32.00	South – West	Being developed as a City Forest
7	Ghoga City Forest	10.40	East	Being developed as a City Forest
8	Shanapur Garhi City Forest	8.00	North East	Being developed as a City Forest
9	Mamurpur City Forest	56.00	North East	Being developed as a City Forest
10	Jindpur City Forst	47.60	North East	Being developed as a City Forest
11	Mukhmelpur City Forest	27.77	North East	Being developed as a City Forest
12	Bawana City Forest	32	North West	Protected Forest, being maintained as a City Forest
13	Garhi Mandi City Forest	300	East	Being developed as a City Forest
14	Anand Vihar City Forest	32	East	Part of the area has been developed as a Railway Terminal

10. Disasters

36. According to the Vulnerability Atlas of India the NCR falls in the, High damage risk zone (MSK VIII) for earthquakes, Very high damage risk zone B (Vb = 50m/s) for wind and cyclone hazards and areas liable to floods, which are more site specific and consist of low-lying areas and the flood plain.

37. The NCR lies in the earthquake zone IV, the second highest rating in the country. Seismicity around Delhi is associated with the major geological structure, known as the Delhi-Hardwar Ridge. Two major lineaments namely Delhi-Haridwar ridge and Delhi-Moradabad faults passing through the territory have potential of generating earthquakes of magnitude upto MSK VIII.

B. Economic Development

11. Population Characteristics

38. Population of NCT of Delhi was 13,850,507, in Census 2001 with 3.85% annual growth rate and 47.02% decennial growth rate during 1991-2001. 10.57% of the State's population lives in East Delhi. 98.75% of the total population lives in urban areas (78.44% for State). Sex-ratio in urban areas of the district was 843 (State-819). Percentage of children below 6 years of age in urban areas of the district was 14.04% (State-14.59%). Total literacy rate (TLR) in urban areas is 84.94%, as against 81.6% for the State. Similarly, FLR in urban area is 79.25% as against 74.59% for State. 32.38% of population form total work force (WPR), close to the State WPR of 32.7%.

12. Industries

39. The key industries in Delhi are Information Technology, Telecommunications, Hotels, Media, Banking and Tourism. The manufacturing industries of Delhi have also expanded by establishment of many consumer goods manufacturing units and offices in the region. Delhi's large consumer market and its abundance of skilled labor witness growth of tertiary sector of industries. The Delhi State Industrial Development Corporation (DSIDC) is involved in Industrial development in Delhi. Agriculture is not a major activity in Delhi. Secondary and tertiary sector of industry are major contributories of employment and economic development in the NCT. In East Delhi district 1327 enterprises are in Agriculture, 94152 enterprises are in non-agricultural industries. In South Delhi 264 enterprises are in Agriculture, 104536 enterprises are in non-agricultural industries. Industrial activities include manufacture of food products, tobacco products, textile products, wooden products, paper products, printing and allied industries, leather industries, chemicals, metals and metallic alloys.

IV. Identification of Environmental Impacts and Mitigation Measures

40. The assessment for each of the sub-projects has been carried out for potential impacts during the following stages of the project planning and implementation:

- **Location impacts.** Impacts associated with site selection, including impacts on environment and resettlement or livelihood related impacts on communities
- **Design impacts.** Impacts arising from project design, including the technology used, scale of operations, discharge standards etc
- **Construction impacts.** Impacts resulting from construction activities including site clearance, earthworks, civil works, etc.
- **O&M impacts.** Impacts associated with the operation and maintenance of the infrastructure built in the project.

A. Land acquisition and resettlement impacts

41. Redevelopment of Sarai Kale Khan ISBT does not involve any land acquisition and there is no involuntary resettlement impact and impact to indigenous peoples. All improvement works are proposed within the ISBT campus in land owned by Government of National Capital Territory of Delhi (GNCTD). However, the project will involve relocation of 9 licensed vendors, including 1 government undertaking, to the transit ISBT from where the interstate buses will ply during the construction of MMTC. These licensed vendors are on a one-year lease and thereafter the continuance of a vendor depends upon if he/she is successful in the open bid for the shop/stall/PCO booth. The transit ISBT will accommodate these licensed vendors until the end of their license period and thereafter they will have to take part in the annual bid process.

42. The relocation of the licensed vendors to the transit ISBT will be done overnight without affecting their livelihood and with minimum disturbance to the passengers. Further, the construction is being carried out in a phased manner to minimise impact to passengers and shopkeepers. Consultations with stakeholders and census and socio-economic surveys have reaffirmed that there will be no impact on the livelihood of the shopkeepers in the transit ISBT and the transit arrangement is acceptable to the shopkeepers. Redevelopment of ISBT at Sarai Kale Khan will come under S-2 category for involuntary resettlement. A short resettlement plan has been prepared in line with the Draft ESMS requirements. The summary of resettlement impacts is given in the following table.

Table: Summary of Resettlement Impacts

Impact	Redevelopment of Sarai Kale Khan ISBT
Permanent Land Acquisition (ha)	0
Temporary Land Acquisition (ha)	0
Affected Households (AHs)	0
Affected Persons (APs)	0
Titled APs	0
Non-titled APs (Leaseholders/Renters and Workers/Employees)	0
Licensed private vendors facing minimal disruption	8[a]
Licensed government/cooperative owned outlets	1
Female-headed AH	0
IP/ST-headed AH	0
BPL AH	1
Affected Structures	0
Affected Trees/Crops	0
Affected Common Property Resources	6[b]
Average Family Size	6.3
Average Household Income	Rs.6,698/- p.m.

[a] *These 8 households will only face minimal disruption during one overnight shifting to the transit ISBT*

[b] *The 6 public toilets are being replaced in adequate number in the transit ISBT*

B. Environmental Impacts

13. Location impacts

43. Sarai Kale Khan MMTC is on an existing inter-state bus terminus which will be upgraded to MMTC. This sub-project is not planned on an environmentally sensitive or culturally important area, and there are no major location or design impacts. Due to the proposed expansion, a few trees will be felled. However the overall impact is expected to be small as the landscaping activities is to include the plantation of trees and therefore will be taking care of the impact of trees felled. There is a mosque used by residents behind Sarai Kale Khan. The construction activities can reduce access to the mosque if appropriate measures are not taken during construction. To address environmental impacts associated with increased consumption of water and energy, increase, sewage generation during operation of the MMTC, the design incorporates environmentally friendly techniques including reuse of water, dual water use systems and good energy management to reduce the overall impact from the project. Given that the sub-project is located in seismic zone IV (the second highest category for earthquake intensities under the Indian classification system) the designs are worked out to ensure that appropriate ISO codes are conformed to.

14. Construction Impacts

44. There will be expected occupational safety and hazards associated with any construction site. Dismantling and disposing of asbestos shelters, which have been used in the earlier bus stand presently located at the site, shall be taken up in accordance with the provisions prescribed.

45. Though not significant, impacts from construction including setting of temporary offices, camp sites, storage of construction material, vehicles, increased traffic and noise from generators and other activities at the construction site shall require addressal. Given that the roads leading to the SKK MMTC are at present also being used for construction activities for the planned metro and railway station, resulting in inconvenience to existing offices and passengers at the site as the bus terminal will be operational even during the construction phase.

46. Waste disposal from the site will however be an issue that will require some attention as apart from waste expected from typical construction activities (soil and waste material, vehicle parts etc.) there will also be waste from the dismantling of the existing bus terminal. The waste disposal shall be done in sites identified for debris disposal by the MCD.

15. O&M Impacts

47. Wastes generated from the MMTC operations would require disposal systems. The waste generation shall include different types of wastes, apart from the management of the liquid waste there will also be food waste, waste from washing and the workshop, cleaning chemicals, packaging and waste from offices. It is expected that much of the water for the MMTC will be sourced from local aquifers. Considering the declining water table in the region, it is suggested that appropriate water conservation and recharge actions be undertaken. Many of these are designed in the project, such as recycling and reusing water and rainwater harvesting. There is also likely to be an increase in the total sewage from the area. In order to deal with this the project has already designed a treatment system – with the sewage after treatment to be reused for irrigation and such purposes. However, care needs to be taken to ensure that there are no leakages and the system does not contaminate the groundwater.

V. Environmental Management Plan

48. Potential environmental impacts identified in the IEE due to implementation of the project components are to be minimized or avoided through appropriate mitigation and avoidance measures mentioned in Table 5. The agencies that are responsible for implementing the measures that are required to be undertaken have been identified.

Table 1: Environmental Impacts and mitigation measures

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
1	**Location Impacts**				
2	**Design and pre-construction Impacts**				
	Clearing of vegetation and trees within the MMTC site	Permanent	Minor	Tree cutting shall be restricted to a minimum, and it will be ensured that vegetation outside the designated construction site is not affected.. Obtain clearance for the cutting of trees from the Forest Department and planning for tree plantation for compensation and green belt development. The landscape plan of the MMTC shall include: sufficient green cover and tree/plant buffers to reduce the noise and other impacts on the area, landscaping activities with species to reduce impact from increase in noise, dust and air pollution and appropriate landscaping designs.	DIMTS & DPR Consultants
	Alterations of drainage pattern of the site resulting in water logging and flooding.	Permanent	Major	Ensure design identifies appropriate drainage needs and includes it in the design plans of the area, including assessing if existing drainage systems will be able to handle the drainage, or make appropriate alternate arrangements.	DIMTS & DPR Consultants
	The project plans to source some of its water from bore wells, with 3 borewells already available at the premises. Considering the existing trends of lowering groundwater table, the continuing withdrawal of water from these borewells may result in i) unsustainable drawdown, and ii) long run reduced water availability	Permanent	Major	Plans / design to undertake demand management practices, like using water saving devices, reusing and recycling water and harvesting rainwater.	
2.2	Sewage generation from toilets, various offices and shops. The total quantum of wastewater will increase with a concentration of various activities in the area.	Permanent	Moderate	The designs shall include provisions for treatment of waste water generated. Ensure that STP can take the required load and has the ability to undertaken appropriate treatment of the sewage/effluents.	DIMTS & DPR Consultants
	Accidents may increase due to the increased traffic in the area due to MMTC operations	Temporary	Moderate	Appropriate design including pedestrian walkways, signages and other appropriate measures to ensure safety of MMTC users and pedestrians	DIMTS & DPR Consultants
	Energy requirements due to enhanced operations and expansion of the terminal	Permanent	Negligible	The designs to include efforts to minimize energy conservation. Choose appropriate power saving methods to reduce power consumption, e.g. use of CFLs, intelligent building systems for energy conservation, energy-efficient chillers. Use solar lighting in open spaces. Reduce the need of lighting in buildings through measures as roof insulation.	DIMTS & DPR Consultants
3	**Pre-construction Activities by Contractor**				
3.1	Temporary offices, construction Camps – Location, Selection, Design and Layout	Temporary	Moderate	All fuel oil / lubricants loading and unloading areas shall be paved; and have separate storm water collection system for separation of oil / lubricants prior to discharge. Provide adequate water supply, sanitation, septic tanks, soak pits of adequate capacity. Restore the site to its original state after use. Proper training of labourers and management of waste, if any Prepare a waste management plan for the camps.	Contractor / Supervision Consultant
3.2	Drinking water availability and water arrangement	Temporary	Severe	The contractor shall be responsible for arrangement of water to the workers at suitable and easily accessible place for the whole construction period. Sufficient supply of cold potable water (as per IS: 10500) to be provided and maintained.	Contractor / Supervision Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
3.3	Identification of disposal sites for construction debris	Permanent	Major	Locations designated by the MCD for debris disposal shall be utilized for disposal of construction debris. These shall be finalized only after certification from the Engineer.	Contractor / Supervision Consultant
3.4	Quarry Operations	Permanent	Major	It has to be ensured that materials are obtained from licensed quarries having environmental clearance. Quality and legality to be examined by the Contractor and copies of environmental clearances for these needs to be submitted prior to sourcing of material.	Contractor / Supervision Consultant
4	**Construction Impacts**				
4.2	Improper stockpiling of construction materials can cause impacts starting from obstruction of drainage, traffic blockage	Temporary	Moderate	Due consideration shall be given for material storage and construction sites such that it doesn't cause any hindrance to daily traffic movement. Stockpiles shall be covered to protect from dust and erosion.	Contractor / Supervision Consultant
4.4	Quarry / Borrow pits Operations	Permanent	Moderate	Adequate safety precautions shall be ensured during transportation of quarry material from quarries to the construction site. Vehicles transporting the material shall be covered to prevent spillage. Operations to be undertaken by the contractor as per the direction and satisfaction of the Engineer.	Contractor / Supervision Consultant
4.5	Stripping, stocking and preservation of top soil	Permanent	Moderate	The topsoil from borrow areas, areas of cutting and areas to be permanently covered will be stripped to a specified depth of 150mm and stored in stockpiles. It will be ensured by the contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles. Such stockpiled topsoil will be returned to cover the disturbed area and used for landscaping of the site.	Contractor / Supervision Consultant
4.13	Soil and Water Pollution due to fuel, lubricants and construction waste	Temporary	Moderate	Oil interceptor shall be provided at construction vehicle parking area, vehicle repair area and workshops ensuring that all wastewater flows into the interceptor prior to its discharge.	Contractor / Supervision Consultant
	Dismantling and disposal of Asbestos Cement Roofing sheets	Permanent	Major	The asbestos wastes shall be disposed off safely to the hazardous wastes landfill site facility managed by the MCD. The dismantling, transportation and disposal shall be taken up under the supervision of the environmental specialist of the Engineer	Contractor / Supervision Consultant
4.16	Generation of Dust	Temporary	Minor	The contractor shall take every precaution to reduce the levels of dust at construction sites to the satisfaction of the Engineer. All earthwork to be protected/covered in a manner acceptable to the satisfaction of the engineer to minimize dust generation. Clearance shall be affected immediately by manual sweeping and removal of debris, or if so directed by the Engineer, the construction site shall be hosed or watered using necessary equipment.	Contractor / Supervision Consultant
4.18	Emission from Construction Vehicles, Equipment and Machinery	Temporary	Moderate	The discharge standards promulgated under the Environmental Protection Act, 1986 shall be strictly adhered to. All vehicles, equipment and machinery used for construction shall conform to the relevant Bureau of Indian Standard (BIS) norms. All vehicles, equipments and machinery used for construction shall be regularly maintained to ensure that pollution emission levels comply with the relevant requirements of SPCB and the Engineer. 'PUC' certificates shall be obtained regularly for all vehicles used for the project. Copies shall be submitted regularly to the Engineer.	Contractor / Supervision Consultant
4.20	Noise from construction Equipments	Temporary	Moderate	Maintenance of vehicles, equipment and machinery shall be regular and to the satisfaction of the Engineer, to keep noise from these at a minimum. All vehicles and equipment used for construction will be fitted	Contractor / Supervision Consultant

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				with exhaust silencers. During routine servicing operations, the effectiveness of exhaust silencers will be checked and if found to be defective will be replaced. Notwithstanding any other conditions of contract, noise level from any item of plant(s) must comply with the relevant legislation for levels of noise emission.	
4.21	Increased risk of accidents for passengers due to common circulatory area for passengers and construction traffic	Temporary	Moderate	The contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, marking flags, lights and flagmen as per Engineer's direction and satisfaction, for the information and protection of traffic approaching or passing through the section under improvement.	Contractor / Supervision Consultant
4.23	Material Handling at Site	Temporary	Minor	All workers employed on mixing asphaltic material, cement, lime mortars, concrete etc., will be provided with protective footwear and protective goggles. Workers, who are engaged in welding works, would be provided with welder's protective eye-shields. The Engineer will be given at least 6 working day's notice of the proposed use of any chemical. A register of all toxic chemicals delivered to the site will be kept and maintained up to date by the Contractor. The register will include the trade name, physical properties and characteristics, chemical ingredients, health and safety hazard information, safe handling and storage procedures, and emergency and first aid procedures for the product.	Contractor / Supervision Consultant
4.25	Safety Measures During Construction	Temporary	Moderate	All relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996 will be adhered to. Adequate safety measures for workers during handling of materials at site will be taken up. The Personal Protective Equipment for workers on the project shall conform to IS codes.	Contractor / Supervision Consultant
4.26	Risk caused by Force Majure	Temporary	Minor	All reasonable precaution will be taken to prevent danger of the workers and the public from fire, flood, drowning, etc. All necessary steps will be taken for prompt first aid treatment of all injuries likely to be sustained during the course of work.	Contractor / Supervision Consultant
4.27	Malaria Risk	Temporary	Minor	The Contractor shall, at his own expense, conform to all anti-malaria instructions given by the Engineer.	Contractor / Supervision Consultant
4.28	First Aid	Temporary	Minor	At every workplace, a readily available first aid unit including an adequate supply of sterilized dressing material and appliances will be provided as per the Factory Rules. Suitable transport will be provided to facilitate transfer of injured or ill person(s) to the nearest hospital. At every workplace and construction camp, equipment and nursing staff shall be provided.	Contractor / Supervision Consultant
4.29	Hygiene	Temporary	Minor	All temporary accommodation must be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing. Garbage bins must be provided in the camps and regularly emptied and the garbage disposed off in a hygienic manner. On completion of the works, all such temporary structures shall be cleared away, all rubbish burnt, excreta tank and other disposal pits or trenches filled in and effectively sealed off and the outline site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the engineer.	Contractor / Supervision Consultant
4.31	Archaeological Property –	Tempora	Minor	The contractor shall take reasonable precaution to prevent his	Contractor /

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
	Chance find if any	ry		workmen or any other persons from removing and damaging any such article or thing and shall, immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out the Engineer's instructions for dealing with the same, awaiting which all work shall be stopped 100 m all directions from the site of discovery. The Engineer shall seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence work on the site.	Supervision Consultant
4.32	Clearing of site and restoration	Temporary	Major	Contractor to prepare site restoration plans for approval by the Engineer. The plan is to be implemented by the contractor prior to demobilization. On completion of the works, all temporary structures will be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the Engineer.	Contractor / Supervision Consultant
4.22	Infrastructure facilities and amenities for passengers at the MMTC	Temporary	Minor	All roadside structures / furniture, protection, intersections, facilities and amenities etc. shall be constructed as per engineering design and to the satisfaction of the engineer.	Contractor / Supervision Consultant
5	**O&M Impacts**				
5.1	Environmental Conditions	Permanent	Moderate	DIMTS will undertake seasonal monitoring of noise, air and water quality through an approved monitoring agency. The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored will be as per the Monitoring Plan prepared.	DIMTS
	Treated sewage to meet the pollution standards	Permanent	Moderate	Proper maintenance and management of the sewage treatment plant Periodically renew the consent-to-operate for the sewage treatment plant from the DPCC	DIMTS
D1	Encourage water reuse and minimization of water use	Permanent	Moderate	Proper maintenance of the water reuse, harvesting arrangements in the Complex, including use of treated sewage for landscaping, flushing and HVAC cooling, Use Dual flush WC cisterns wherever possible, Adopt low flow and sensor-based water fixtures, Use drip irrigation system for landscaped areas and ensure rainwater harvesting systems are well-maintained	DIMTS
	Air pollution and safety hazards caused by congestion created by vehicles at entry and exit points	Temporary	Moderate	Ensure all entry and exit points are clear of blockages and traffic in the MMTC runs smoothly Ensure that there is parking space and roads, entrance and exits are free of congestions. Make it mandatory for all buses meant for the bus terminal to wait sufficiently long for passengers to get in or out	DIMTS
	Hazards due to non maintenance of the waste management systems in the MMTC	Temporary	Moderate	Continuous monitoring of the performance of the operators carrying out waste management of the MMTC. Enhancing public awareness, through campaigns, signages etc to adopt proper waste disposal practices	DIMTS
	Accidents may be expected from the workshop, during loading and unloading and on the roads. Both vehicles and people may be at risk. Accidents like fires may occur due to short circuits, cooking and also the generator used for power	Temporary	Significant	Identify and implement an accident and emergency management plan, particularly in the workshop area. Ensure all systems are in good order, have fire extinguishers, and ensure adequate ventilation and escape routes, as required. Establish and maintain an emergency response system include a fire fighting system in line with the National Building codes and other relevant IS codes	DIMTS

Sl No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
	power.				

VI. Institutional Requirements

A. Institutional Arrangements

49. This project is to be implemented by the Delhi Integrated Multi Modal Transit System Ltd (DIMTS)[3]. DIMTS will have one specialist identified to overseeing the implementation of the EMP. An Environmental Officer (consultant) shall be inducted within the DIMTS to address the environmental impacts due to the project. The identified officer should be a Civil Engineer specializing in Environment or a related field with experience in the management of infrastructure projects. S/he should be similar with Indian legislation and the implementation of multi/bilateral loan projects.

50. Roles and Responsibilities

- Review of IEE and other environment documents based upon ADB's Environmental Assessment Guidelines, or other multilateral or bilateral agency guidelines, as required.
- Liaise and obtain clearances from with required state and central departments for clearances and compliance to regulations.
- Monitor and oversee the implementation of the Environmental Management Plan
- Ensure inclusion of EMP in contractor's ToRs.
- Oversee implementation and monitor compliance to the EMP
- Undertaken required interactions with civil society groups and community for projects under implementation
- Ensure inclusion of public concerns and grievances in EMP and project implementation. Undertake dialogue with affected communities, as required.
- Review environmental performance of project through periodical environmental monitoring reviews. Where additional environmental safeguards are identified incorporate them in project design, construction or implementation or other follow-up actions, as required.
- Provide required support for the management of environmental concerns in the implementation of the project
- Develop, review and plan and implement training and capacity building for contractors and consultants involved in the project

51. A consultant shall be hired for supervising construction activities. The Supervision consultant team will include an officer identified for overseeing the implementation of the EMP. The roles and responsibilities of this specialist will be,

- Work closely with DIMTS environmental specialist for the implementation of EMP and ensure compliance to environmental safeguards, support its implementation
- Work with DIMTS environmental specialist for getting environmental clearances for the project
- Review of EMP implementation and advice the DIMTS environmental specialist on the implementation status
- Review any changes in project design, identify environmental safeguards if required and work with the DIMTS environmental specialist to reflect identified safeguards in EMP
- Ensure all identified systems – safety, accident management and control, waste are in place, functioning and implementing personnel have adequate training to implement actions
- Consultation with stakeholders and inclusion of their concerns in project implementation
- Incorporate additional environmental safeguards as required during project implementation.

[3] DIMTS is a Joint Venture Company set up with equal equity of the Government of National Capital Territory of Delhi (GNCTD) and Infrastructure Development Finance Company (IDFC).

B. Environmental Monitoring Plan

52. Prior to developing a monitoring plan there is a need for the development of a baseline for some activities. This would help with the monitoring activities. The baseline is described below.

Sl. No.	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Responsibility	Cost estimates INR
1	Air Quality	Pre construction	SPM and RSPM, NOx, CO	Two sites, one in the present MMTC and one at the entrance	Once prior to construction	DPR consultant	4000/sample
2	Noise	Pre construction	Decibels	Two sites, one in the present MMTC and one at the entrance	Once prior to construction	DPR consultants	1000/sample
3	Water quality	Pre construction	Ground water quality	Tube wells currently in operation within the site	Once, prior to construction	DPR consultants	2000/ sample
4	Site for quarries and borrow pits, construction camps etc	Pre construction	The site situation –for rehabilitation, photographs Visual quality, nature and type of vegetation, soil quality etc	All sites identified for quarries, borrow pits, waste and construction labour camps and offices	Once prior to construction	DPR consultants/ agency identified to supervise construction	30,000 lump sum

53. Monitoring Actions

Sl. No.	Attributes	Stage	Parameters to be Monitored	Location	Frequency	Responsibility	Cost estimates INR
1	Air Quality	Construction	SPM and RSPM, NOx, CO	Two sites, within the construction site, including one in the area of passenger movement	Thrice annually	Contractor	4000/sample
2	Noise	Construction	Decibels	Two sites, within the construction site, including one in the area of passenger movement	Thrice annually	Contractor	1000/sample
3	Water quality	Construction	Surface water quality	Tube wells currently in operation within the site	Thrice annually	Contractor	2000/sample
4	Site for borrow pits, construction camps etc	Post Construction	After construction activity over – if rehabilitated	Quarries, borrow pits, waste and construction labour camps and offices sites	After completion of construction activities at site	Contractor	40,000 total

C. Training & Capacity Building

54. The proposed training program along with the frequency of sessions is presented in the table below.

Program	Description	Participants	Form of Training	Duration	Trainer / Agency
Introduction and sensitisation to environment issues	Sensitisation on environmental concerns ▪ Environmental impacts of urban infrastructure projects ▪ GoI environmental regulations ▪ ADB/multilateral/bilateral environmental regulations ▪ Coordination between departments for	Transport department and DIMTS officials responsible for implementing project and office in-charge of implementing environmental safeguards Contractor's representative	Workshop	Half day workshop	External Consultants/ NCRPB

	implementation of environmental safeguards				
EMP implementation	▪ Identification of environment impacts ▪ Monitoring and reporting for EMP ▪ Public interactions and consultations ▪ Reporting and coordination ▪ Coordination for consents and with various departments ▪ Monitoring formats filling and review of impacts	Transport department officials, DIMTS officials Officer in charge of implementing this project activities, officer implementing EMP for agency/contractors	Lecture and field visit	Three day session	External Consultants/ NCRPB
Recurring training programmes	Management of Environmental impacts Identification of Environmental impacts Environmental regulations Environmental monitoring and review	Transport department officials, DIMTS officials, officer in-charge of project implementation, identified officer in-charge of implementing EMP	Lecture and interactive session	One day session	External Consultants/ NCRPB

D. Environmental Budget

55. As part of good engineering practices in the project, there have been several measures as erosion prevention, rehabilitation of borrow areas, safety, signage, provision of temporary drains, etc the costs for which will be included in the design costs. Therefore, these items of costs have not been included in the IEE budget. Only those items not covered under budgets for construction and RP are costed in the IEE budget. The IEE costs include mitigation, monitoring and capacity building costs. The summary budget for the environmental management costs for the project is presented in the following table.

Sl. No.	Particulars	Stages	Unit	Total number	Rate (INR)	Cost (INR)
A.	Mitigation Measures					
1	Management of dust and sand during construction activities – suppression etc	Construction	Lump sum			100,000.00
2	Ensuring occupational safety for workers at camps and construction sites	Construction	Lump sum			200,000.00
	Sub -Total (A)					300,000
B.	Monitoring Measures					
	Air		Per sample	2	4000	8000
	Air		Per sample	8	4000	32000
	Noise		Per sample	2	1000	2000
	Noise		Per sample	8	1000	8000
	Water quality		Per sample	3	2000	6000
	Water quality		Per sample	12	2000	24000

Sl. No.	Particulars	Stages	Unit	Total number	Rate (INR)	Cost (INR)
	Sub -Total (B)					80000
C	Capacity Building					
	Sensitisation, awareness	Pre-construction	Lump sum			472000
	Monitoring and management	Construction	Lump sum			187000
	Sub-Total (C)					659000
	Total (A+B+C), INR					1039000

VII. Public Consultation and Information Disclosure

A. Process of Consultation Followed

56. During the preparation of the project, consultations with stakeholders were held on environmental issues with DIMTS, communities and affected persons. Summary of the consultations undertaken is given in Table below.

Table 2: Summary of Consultations

S.No.	Place	Date	Number of participants	Participants	Issues discussed
1	Sarai Kale Khan	26 October, 2009		Shopkeeper	Any temporary shifting during the construction period for shops should ensure that the shops allocated in the new shelter are at least the same size as that of the present shops. A well managed and developed multi modal transport centre is expected to attract larger number of passengers and will have a positive impact on their business
2	Sarai Kale Khan			Bus operators	The lighting at the ISBT is poor, resulting in thefts and feeing of insecurity. The ISBT is active at night but passengers avoid the area during night hours. The bus operators identified the need for a rest room for the conductors and drivers along with a canteen to serve them proper meals during their rest hours at the bus stop. Need for greater comfort for passengers – improved shelters, food and refreshment stalls, signage and a public addressing system.
4	Sarai Kale Khan			Users	There is inadequate signage and no announcements therefore the present system is difficult to negotiate. There is insufficient information on when a bus will arrive or leave
5	Delhi			DIMTS and management at Sarai Kale Khan	The bus shelters were shifted to the new area due to water logging in the earlier area after rains as it is low lying and poorly drained. However, that area has better access to the railway station and the main road. The planned MMTC is to have water recycling, trees and all facilities to ensure that there will be management of any environmental impacts
6	Delhi			Member of Legislative Assembly	There is a need for greater comfort for passengers Passenger safety must be considered for the MMTC

B. Framework for continued public participation

57. A grievance redressal cell will be set up within the DIMTS to register grievances of the people regarding technical, social and environmental aspects. This participatory process will ensure that all views of

the people are adequately reviewed and suitably incorporated in the design and implementation process. Further, to ensure an effective disclosure of the project proposals to the stakeholders and the communities in the vicinity of the project locations, an extensive project awareness campaigns will be carried out.

58. For the benefit of the community the Summary IEE will be translated in the local language and made available at Office of the DIMTS, ISBT Kashmere Gate, and the Project Office of the DIMTS at the Sarai Kale Khan Terminal. These copies will be made available free of cost to any person seeking information on the same. Hard copies of the IEE will be available in the DIMTS office, and accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. On demand, the person seeking information can obtain a hard copy of the complete IEE document at the cost of photocopy from the office of the office of the DIMTS, on a written request and payment for the same. Electronic version of the IEE will be placed in the official website of DIMTS and the website of ADB after approval of the documents by Government and ADB. The DIMTS will issue notification on the disclosure mechanism in local newspapers, ahead of the initiation of implementation of the project, providing information on the project, as well as the start dates etc. Furthermore, as this project works towards improving resource use efficiencies there is a need for creation of public awareness on identified issues like management of water and energy.

VIII. Findings and Recommendations

59. It is to be noted that as per the statutory requirements of Government of India (Environmental Impact Assessment Notification, September 2006, and its subsequent amendment 2009) Environmental Impact Assessments are not required for the proposed MMTC subproject. The proposed development does not fall either in Category A or in Category B as per GoI EIA requirements. The significance of the environmental impacts will be more due to the construction related impacts than any impacts associated with areas of rich environmental sensitivity. It is to be noted that the resultant potential impacts from these proposals can be offset through provision of proven mitigation measures during the design and adoption of good engineering practices during construction and implementation. EMP prepared to this affect addresses these potential impacts through appropriate mitigation, management and monitoring measures.

60. The effective implementation of the measures proposed will be ensured with the technical expertise of an Environmental Specialist as part of the Supervision Consultants. Further, the environmental monitoring plans prepared as part of the EMP will provide adequate opportunities towards course correction to address any residual impacts during construction or operation stages.

IX. Conclusions

61. The proposed sub-project will have significant benefits to the population. Overall the construction of this SKKMMTC is expected to be beneficial for the area as it ensure the smooth flow of buses and passengers and improve their comfort. Also, considering the low levels of environmental impacts expected it will not require any major mitigation. However, there are a few issues that would require mitigation, for which proven measures have been identified and included in the EMP. The proposed designs include initiatives towards environmentally sound development, incorporating principles of energy conservation, resource minimization, rain water harvesting, energy efficient building designs etc. The proposed components should proceed through to design and implementation, subject to mitigation measures and monitoring programs as per EMP for potential impacts identified in the IEE. These will be updated and detailed during detailed design stage, and based on above recommendations. It may be emphasized that the present IEE, which identifies potential impacts and EMP which presents appropriate mitigation measures, is sufficient enough to safeguard the environment. There are no significant adverse impacts, which are irreversible or may lead to considerable loss/destruction of environment, envisaged. All the impacts are generic and have proven mitigation measures to minimize/mitigate the same.

Appendix 1: Environmental Information Format for Screening

No.	Title
1.	Project title : **Sarai Kale Khan MMTC**
2.	Project location (Area / district): **Sarai Kale Khan**
3.	Is the project in an identified ecosensitive area or adjoining an ecosensitive area ? (Yes /No) If Yes, which is the area? **No**
4.	Will the project create significant / limited / no environmental impacts during the construction stage? (Significant / limited / no impacts) **Limited impacts – REA Checklist for the project is given below.**
5.	Will the project create significant / limited / no environmental impacts during the operational stage? (Significant / limited / no impacts) **Limited impacts – REA Checklist for the project is given below.**
6.	Do projects of this nature / type require prior environmental clearance either from the MOEF or from a relevant state Government department? (MOEF / relevant State Government department / No clearance at all) **No clearance from MoEF reqd.** MMTC will require clearance under the Water Pollution (Control and Regulation) Act, 1974, and clearance for felling of trees from the state forest department.
7.	Does the project involve any prior clearance from the MOEF or State Forest department for either the conversion of forest land or for tree-cutting? (Yes / No). If yes, which? **Yes, for cutting of trees from the State Forest Department**.
8.	Please attach photographs and location maps along with this completed Environmental Information Format For Screening.

URBAN DEVELOPMENT

Instructions:

- This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
- Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

SCREENING QUESTIONS	Yes	No	REMARKS
A. PROJECT SITING IS THE PROJECT AREA…			
▪ DENSELY POPULATED?	☐	■	The identified site is a bus stand and is to be upgraded to an MMTC. It does not have people living in it.
▪ HEAVY WITH DEVELOPMENT ACTIVITIES?	☐	■	A metro station is planned near the MMTC however there is no major development activity in the area
▪ ADJACENT TO OR WITHIN ANY ENVIRONMENTALLY SENSITIVE AREAS?			The project is not on or near any culturally heritage or environmentally sensitive area. There is however a mosque at the site. Access to this site during the construction phase must be ensured.
• CULTURAL HERITAGE SITE	☐	■	
• PROTECTED AREA	☐	■	
• WETLAND	☐	■	
• MANGROVE	☐	■	

• ESTUARINE	☐	■	
• BUFFER ZONE OF PROTECTED AREA	☐	■	
• SPECIAL AREA FOR PROTECTING BIODIVERSITY	☐	■	
• BAY	☐	■	
B. POTENTIAL ENVIRONMENTAL IMPACTS WILL THE PROJECT CAUSE…			Urban Development, page 2
▪ impacts on the sustainability of associated sanitation and solid waste disposal systems and their interactions with other urban services.	■	☐	Waste from various activities are expected – both sewerage and solid waste. The project has planned for waste segregation and composting to reduce overall solid waste and an STP for its sewage
▪ deterioration of surrounding environmental conditions due to rapid urban population growth, commercial and industrial activity, and increased waste generation to the point that both manmade and natural systems are overloaded and the capacities to manage these systems are overwhelmed?	☐	■	Safeguards designed in the project like landscaping, reuse and recycling of both solid and liquid waste are expected to be positive on the environment as the present bus terminal does not have any of these systems in place.
▪ degradation of land and ecosystems (e.g. loss of wetlands and wild lands, coastal zones, watersheds and forests)?	☐	■	There are no such systems therefore impact is expected.
▪ dislocation or involuntary resettlement of people	☐	■	No people stay here and therefore they will not be relocated. There are shops and businesses and after construction they can bid for the shop spaces identified as a part of the MMTC.
▪ degradation of cultural property, and loss of cultural heritage and tourism revenues?	■	☐	There is a mosque in the present ISBT and is expected to continue to exist even after the new MMTC is constructed.
▪ occupation of low-lying lands, floodplains and steep hillsides by squatters and low-income groups, and their exposure to increased health hazards and risks due to pollutive industries?	☐	■	This area is not low-lying or on floodplains. The area is a bus stop which is to be upgraded as a MMTC.
▪ water resource problems (e.g. depletion/degradation of available water supply, deterioration for surface and ground water quality , and pollution of receiving waters?	■	☐	Water for the area is to be taken from groundwater sources, treated and used. However, there are plans for water harvesting, recycling and the reuse of water.

▪ air pollution due to urban emissions?	■	☐	There will be emissions due to the large number of buses and other vehicles plying in the area. The project has tried to compensate this with landscaping with a large number of trees.
▪ social conflicts between construction workers from other areas and local workers?	☐	■	There is expected to be no such impact
▪ road blocking and temporary flooding due to land excavation during rainy season?	■	☐	There could be flooding in the area and dewatering is being considered.
▪ noise and dust from construction activities?	■	☐	There will be dust and noise from construction activity and therefore machines and vehicles that create least disturbance and are well maintained are suggested. Also, dust sheets and sprinkling of water is suggested to reduce dust.
▪ traffic disturbances due to construction material transport and wastes?	■	☐	It may occur and therefore appropriate timing of transport vehicles is suggested to minimise impact.
▪ temporary silt runoff due to construction?	☐	■	No such impact is anticipated
▪ hazards to public health due to ambient, household and occupational pollution, thermal inversion, and smog formation?	☐	■	Impact not anticipated
▪ water depletion and/or degradation?	■	☐	May occur and therefore the design has planned for an STP and also water harvesting and reuse and efficient use of water
▪ overpaying of ground water, leading to land subsidence, lowered ground water table, and salinization?	☐	■	Landscape activities are expected to ensure sufficient unpaved area and recharge of groundwater table along with the water harvesting activities.
▪ contamination of surface and ground waters due to improper waste disposal?	■	☐	This may occur and proper maintenance of identified systems should minimise any such impact
▪ pollution of receiving waters resulting in amenity losses, fisheries and marine resource depletion, and health problems?	☐	■	No such impact anticipated

Existing Entry of SKK ISBT

Poor drainage condition

Platform and Passenger Shelter

SKK Boundary wall.