

Initial Environmental Examination Report

A. PATAUDI WATER SUPPLY PROJECT

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Revised

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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 Plannig 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.

4. This IEE Report was prepared by the Project Preparatory Technical Assistance (PPTA) Consultant and was reviewed and approved by ADB in March 2010. Subsequent to this, the project components have been modified necessitating this IEE revision. The major change in project scope is that the water source and water treatment plant have been removed from the project. As per the new proposal, treated water will be supplied from a common Water Treatment Plant (WTP) that is proposed as part of water supply project of Nuh Town.

B. Compliance to ESMS of NCRPB

5. 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

6. 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

7. 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 triggers¹ 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 assessment² 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

8. 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

9. 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.



10. Besides the entire population of Pataudi, the project envisages coverage of another adjoining town of Hailey 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.
11. 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.
12. 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

13. 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

14. 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

15. 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.

16. Overall project comprises of Transmission main from KMP expressway to Pataudi & Hailymandi, CWR, boosting station at Pataudi and Hailymandi in zone-I and zone-II and Distribution network in Pataudi and Hailymandi.

3. Bulk Transmission of treated water

17. A 600 mm i/d DI rising main has been proposed from KMP expressway to Booster pumping station at Pataudi. The pipe line has been designed keeping in view of the prospective water demand for the year 2042 for Pataudi town, adjoining village & Hailymandi. 500 mm, 450 mm and 300 mm i/d DI rising main has been proposed from Pataudi town to boosting stations at Hailymandi.

4. Treated water storage, service reservoirs and booster stations

18. Treated water storage will be provided at Pataudi & Hailymandi. Two ground level service reservoirs (GLSR) with capacity of 1540 cum and 1820 cum are proposed one for each zone which corresponds to half day demand of the design year 2027. Another two ground level service reservoirs (GLSR) with capacity of 2100 cum and 1488 cum are proposed one for each zone which corresponds to half day demand of the design year 2027.

19. 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.

5. Water metering

20. Electromagnetic flow meters are proposed at all key locations, e.g., GLSR, 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.

6. Treated water distribution system

21. 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 37 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.

7. Power supply

22. Power supply at the booster pumping station shall be meter by erecting independent feeders at both the towns. Adequate provision to this in the sub-project capital cost has been made.

C. Implementation Schedule

23. The sub-project will be implemented by the PWD-PHED over a period of 2 years from the date of contract awarded. 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 7 months.
24. For the implementation phase, the bar chart shows activities according to the sub-works proposed in the DPR i.e., 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

25. 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

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. 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

29. Gurgaon district is occupied by Quaternary alluvium and Pre-Cambrian meta- sediments of Delhi Super Group, represented by Alwar quartzites, 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 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

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 is 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/m³ (Winter) to 223 µg/m³ (Summer); RPM ranging from 20 µg/m³ (Winter) to 61 µg/m³ (Summer); SO₂ ranging from 6 µg/m³ (Winter) to 21 µg/m³ (Summer). NO_x ranging from 7 µg/m³ (Winter) to 23 µg/m³ (Summer). CO values were found to be below the detectable limit of 114.5 µg/m³. (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 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 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 adansoniana* (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, Sonapat-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 Gurgaon 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
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. 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.
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. Pataudi 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 utilization and resettlement impacts

45. All the works will be conducted on government owned lands and there is no private land acquisition in the project. The pipelines will be laid along the roads, in the right of way. However, the strip of land along major roads in Haryana is notified as Protected Forest, and therefore laying pipeline in this strip of land requires permission of forest department. The project involves 5 acres of such forest land for laying of 18.1 km of water transmission main, and therefore requires diversion of forest land for non-forest purpose (i.e. laying of water pipeline). Both boosting stations proposed are being sited in existing Municipality land. Water from off-take point to boosting station will be transferred through transmission main.

46. As per the Forest Department procedures for diversion of forest land for non-forest purposes, besides compensation in monetary values as fixed by the FD (for afforestation and Net Present Value (NPV) of trees, if any), the equal amount of non-forest land is to be provided to forest department anywhere in the State of Haryana for raising the afforestation. The PHED is in the process of identifying a piece of land from its own land resources or if required, the PHED will request the State Government to allot unused land for the purpose. Therefore it is unlikely to involve any private land acquisition.

47. The water transmission mains are likely to cause temporary disruption to commercial establishment and residences along the alignment.

48. The project will not impact any households and does not impact any common property resources.

49. 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

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 an 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

Supply 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.

B. Environmental Impacts

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

51. 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 utilization of 5 acres is envisaged due to the proposed project components. Land belongs to forest department
- 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 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 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.

52. 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

53. 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.

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.

- 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 tracks 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
54. 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.
55. With this impacts and mitigation measures in view an EMP is worked out and provided as an independent document.

V. Environmental Management Plan

56. 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

SI No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
1 Location Impacts					
1.1	Temporary impacts during construction	Temporary	Minor	Compensated as per the Resettlement Plan	PHED
1.5	Laying of transmission mains would involve cutting and filling	Permanent	Major	The transmission main alignment is proposed from KMP Expressway to Booster pumping station at Pataudi. The pipeline will be laid underground and will follow the existing road alignment. Cut and fill along the transmission 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 main transportation pipelines and the primary distribution network.	Permanent	Moderate	Minimize tree-cutting to the extent feasible for the the water distribution network. Minimize it to extent possible by exploring alternative design options. Some tree felling may exist for the construction of main transportation pipeline from KMP Expressway to Boosting station at Pataudi. Obtain Forest Department clearance for the cutting of trees 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 ⁴	No impacts on religious structures. Proper measures will be taken care to change the alignment and avoid impact on religious structures.	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

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

SI No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
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 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	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: <ul style="list-style-type: none"> • 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 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	Contractor / Supervision Consultant

SI No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				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.	
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 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
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 tracks 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	Contractor / Supervision Consultant

SI No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				private roads, or any other access to properties, whether public or private.	
	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 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 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	Contractor / Supervision Consultant

SI No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
				arrangements for construction under traffic and details of traffic arrangement after cessation of work each day.	
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 Majeure	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
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

SI No	Environmental Issues	Duration / Extent	Magnitude	Mitigation Measures	Responsibility
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 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

57. 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.

58. 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

59. 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

60. 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

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.

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

62. 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

63. 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 <ul style="list-style-type: none"> ▪ Environmental impacts of road's projects ▪ Gol 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 <ul style="list-style-type: none"> ▪ 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 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-charge of project implementation, identified officer in-charge of implementing EMP	Lecture and interactive session	One day session	External Consultants/ NCRPB

D. Environmental Budget

64. 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)
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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

65. 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	<p>The need for the scheme – the quality of the water and the water sustainability.</p> <p>The present water supply network is old, damaged and in part made of plastic pipes.</p> <p>Tree roots have in places broken these pipes resulting in contamination of the supplied water and lowering the total water supplied in the town.</p> <p>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.</p>
2	Pataudi			Elected representatives	<p>Requirement for a water supply system that ensures even even pressure to all parts of the town</p> <p>Present water supply network is not for whole city and the pressure is low</p> <p>Many areas not covered by existing schemes are using groundwater, however this water is contaminated by city's sewage</p> <p>The present water supply network is old, damaged and also consists in parts of plastic pipes.</p> <p>Tree roots have in places broken these pipes resulting in contamination of the supplied water and lowering the total water supplied in the town.</p> <p>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</p> <p>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.</p>
2	Pataudi	26 October,		Councillors	<p>Since there are a number of drinking water tubewells in the town the water of</p>

S.No.	Place	Date	Number of participants	Participants	Issues discussed
		2009			<p>these tubewells gets contaminated by the sewage, leading to diarrhoeal diseases.</p> <p>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.</p> <p>The people feel that they will be willing to pay for the convenience of a sewerage system</p>
3.	Rewari Road, Pataudi	26 October, 2009	3	Shop owners and keepers	<p>There was no objection to the construction activities that may occur when the water and sewer network is laid.</p> <p>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.</p>
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

66. 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.

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 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

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 sub project. The proposed development does not fall either in Category A or in Category B as per Gol 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 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.

70. Apart from construction related impacts the major impacts during operation of 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...	<input type="checkbox"/>	<input type="checkbox"/>	
▪ DENSELY POPULATED?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
▪ HEAVY WITH DEVELOPMENT ACTIVITIES?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	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	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• PROTECTED AREA	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

SCREENING QUESTIONS	Yes	No	REMARKS
• WETLAND	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• MANGROVE	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• ESTUARINE	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• BUFFER ZONE OF PROTECTED AREA	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• SPECIAL AREA FOR PROTECTING BIODIVERSITY	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
• BAY	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ hazard of land subsidence caused by excessive ground water pumping?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ social conflicts arising from displacement of communities ?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ delivery of unsafe water to distribution system?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

SCREENING QUESTIONS	Yes	No	REMARKS
▪ inadequate protection of intake works or wells, leading to pollution of water supply?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ over pumping of ground water, leading to salinization and ground subsidence?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ excessive algal growth in storage reservoir?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ increase in production of sewage beyond capabilities of community facilities?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ inadequate disposal of sludge from water treatment plants?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ impairments associated with transmission lines and access roads?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	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.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ health and safety hazards to workers from the management of chlorine used for disinfection and other contaminants?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Accidents can take place and an appropriate safety plan is to be a part of the project design
▪ dislocation or involuntary resettlement of people	<input checked="" type="checkbox"/>	<input type="checkbox"/>	This will be addressed in the Resettlement Plan
▪ social conflicts between construction workers from other areas and community workers?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
▪ noise and dust from construction activities?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Timing, low noise machines, etc are to be used to reduce noise and dust disturbances
▪ increased road traffic due to interference of construction activities?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Appropriate timing and use of alternate paths for traffic can help reduce traffic disruption
▪ continuing soil erosion/silt runoff from construction operations?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

SCREENING QUESTIONS	Yes	No	REMARKS
<ul style="list-style-type: none"> ▪ delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals? 	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
<ul style="list-style-type: none"> ▪ accidental leakage of chlorine gas? 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	May occur and the technical design needs to include an accident management plan
<ul style="list-style-type: none"> ▪ excessive abstraction of water affecting downstream water users? 	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
<ul style="list-style-type: none"> ▪ competing uses of water? 	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
<ul style="list-style-type: none"> ▪ increased sewage flow due to increased water supply 	<input checked="" type="checkbox"/>	<input type="checkbox"/>	This will occur, however a sewerage system is also planned
<ul style="list-style-type: none"> ▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant 	<input type="checkbox"/>	<input checked="" type="checkbox"/>	