Initial Environmental Examination Report

A. NUH 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.

April 2014

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CHAPTER - 1

INTRODUCTION

1.1 Background

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.

'Augmentation of water supply for Nuh town and adjoining 18 villages' 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 and villages.
(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.
(e) To reduce water borne diseases in the area.
(f) To increase life span of residents.

This Draft 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. Project being a Design-build-Operate contract, IEE/EMP is prepared based on preliminary design and will be updated/revised during the detailed design stage.

1.2 Extent of IEE Study

The subproject implementation shall comply with the policies of Government of India (GoI), Government of Haryana (GoH) and procedures/policies of NCRPB. Government regulations and the NCRPB policy require that impacts of the development projects have to be identified at the

beginning and mitigation measures be incorporated in the project to reduce those impacts to acceptable levels. This is generally done through the process of environmental impact assessment.

1.3 Government Law and Policies

The GoI EIA Notification of 2006 (replacing the EIA Notification of 1994), sets out the requirement for Environmental Assessment in India. This states that Environmental Clearance (EC) is required for specified activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorized as A or B depending on the scale of the project and the nature of its impacts.

Category A projects requires EC from the national Ministry of Environment and Forests (MoEF). The proponent is required to provide preliminary details of the project in the prescribed manner with all requisite details, after which an Expert Appraisal Committee (EAC) of the MoEF prepares comprehensive Terms of Reference (ToR) for the EIA study. On completion of the study and review of the report by the EAC, MoEF considers the recommendation of the EAC and provides the EC if appropriate.

Category B projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA). The State level EAC categorizes the project as either B1 (requiring EIA study) or B2 (no EIA study), and prepares ToR for B1 projects within 60 days. On completion of the study and review of the report by the EAC, the SEIAA issues the EC based on the EAC recommendation. The Notification also provides that any project or activity classified as category B will be treated as category A if it is located in whole or in part within 10 km from the boundary of protected areas, notified areas or inter-state or international boundaries.

None of the components of this water supply improvement project in Nuh does fall under the ambit of the EIA Notification, and, therefore EC is thus not required.

1.4 Environmental and Social Management System of NCRPB

Recognizing the importance of environmental and social issues that can arise in infrastructure projects, NCRPB has formulated an Environmental and Social Management Systems (ESMS) in line with Government and other multilateral agencies like ADB 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 funded by NCRPB. 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. Implementing Agencies (IAs) will have to comply with the ESMS and Policy.

1.5 Environmental Policy

Policy Statement of NCRPB.

"National Capital Regional Planning Board (NCRPB) will continually strive to ensure and enhance effective environmental management practices in all its operations". This is aimed to achieve through:

- Minimizing negative environmental (including health & safety) impacts in its operations and

risks to the environment (particularly eco-sensitive areas and culturally important areas) and people who may be affected through formulating and implementing commensurate plans.

- Ensuring that environmental safeguards - defined as requirements of applicable Indian environmental legislation and multilateral / bilateral funding agencies - are being adequately integrated by the project proponent / IA in the planning, design, construction prior to its financing and in its implementation during the operational phase.
- Ensuring that compliance to all applicable national and local environmental legislation.
- Encouraging that public and stakeholder consultation be carried out by the project proponent / IA and disclosing the required information in all stages of the project cycle.
- Integrating environmental risk into its overall internal risk management Analysis.
- Including environmental management considerations in all aspects of operations and interactions with the project proponent / IAs in all stages of the project cycle.

This policy statement emphasizes NCRPB's sensitivity, concern and commitment to environmental safeguards. NCRPB will strive to ensure that the projects that it supports meets government policies and as well as of the bilateral/multilateral agencies such as ADB.

1.6 Environmental Assessment Requirements

The nature of the assessment required for a project depends on the significance of its likely environmental impacts, which are related to the type and location of the project, the sensitivity, scale, nature and magnitude of its potential impacts, and the availability of cost-effective mitigation measures. According to NCRPB ESMS, the projects are screened for their expected environmental impacts and are assigned to one of the following categories: E1, E2 or E3.

Table 1-1: Environmental Category

Environmental Scenario	**NCRPB's Categorization**	**MOEFs Categorization**	**ADB Categorization**
Significant impacts or in eco-sensitive area	E1	A	A
Limited impacts	E2	B1 or B2 or No Category	B
No impacts	E3	No Category	C

(i) Significant impacts or in eco-sensitive areas (Category E1):

If the project has significant adverse environmental impacts that are irreversible, diverse, or unprecedented, then it is regarded to have environmental scenario. These impacts may affect an area larger than the sites or facilities subject to physical works. These impacts will be considered significant if these are in eco-sensitive areas.

(ii) Limited environmental impacts (Category E2):

If the project has impacts that are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed.

(iii) No environmental impacts (Category E3): If the project is likely to have minimal or no adverse environmental impacts, then it is regarded to have this environmental scenario.

1.7 Environmental Regulatory Compliance

The EIA Notification of the MoEF, September 2006, does not warrant environmental clearance from the MoEF for drinking 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.

1.8 Permissions Required

Following permissions are required in present project of providing water supply to Nuh town and 18 adjoining villages.

i. Irrigation Authority – permission for outlet from canal

As per project for construction of dedicated Gurgaon water supply channel already sanctioned by NCRPBP, There is share earmarked for drinking water supply to towns and villages enroute. There is a provision for 50 cusecs for PHED to be supplied at Badli. The SE Irrigation has recommended to his Engineer in Chief for releasing 14.26 cusecs for this project at Badli (copy enclosed). So permission exists in principal.

ii. DHVBNL – Permission for electric connection

Permission has been applied with DHVBNL authorities in Gurgaon and obtained permission in principal.

Iii Forest Department- permission for cutting of trees

As no tree is proposed to be cut, so no permission is required at this stage. However permission to lay pipe line in the ROW of PWD roads already applied to DFO Nuh.

iv. PWD (B&R) –Permission for laying pipe line on road berm

Permission to lay pipe in ROW of road was applied in Executive Engineer PWD (B&R) Nuh office and permission has been received in principal.

v. KMP Expressway – permission for laying pipe line

Permission has been applied with KMP expressway Authority New Delhi and they have agreed in principal.

vi. CGWA – for extraction of water
As no tubewell is proposed to be drilled under this project, hence no sanction is required.

vii. NHAI – crossing of NH-8
Permission has been applied for crossing of NH-8 with NHAI Gurgaon with trenchless technology and permission is still awaited.

viii. Indian Railways – crossing of railway lines of Gurgaon Farukhnagar and Gurgaon Rewari.
Permission has since been applied for crossing of these rail tracks with rail authorities.

1.9 Report preparation

The proposed subproject of augmentation of water supply scheme in Nuh and its adjoining villages is unlikely to have significant impacts. The project site is also not located near heritage buildings or near any eco- sensitive area. The subproject is however likely to have typical impacts associated with the construction activity in urban areas and therefore classified as Category E2.

1.10 Report Structure

This Report contains 8 chapters including this introductory chapter: (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.

1.11 Locational Plan

The location plan of project area is attached for reference in figure -1.

Figure -1

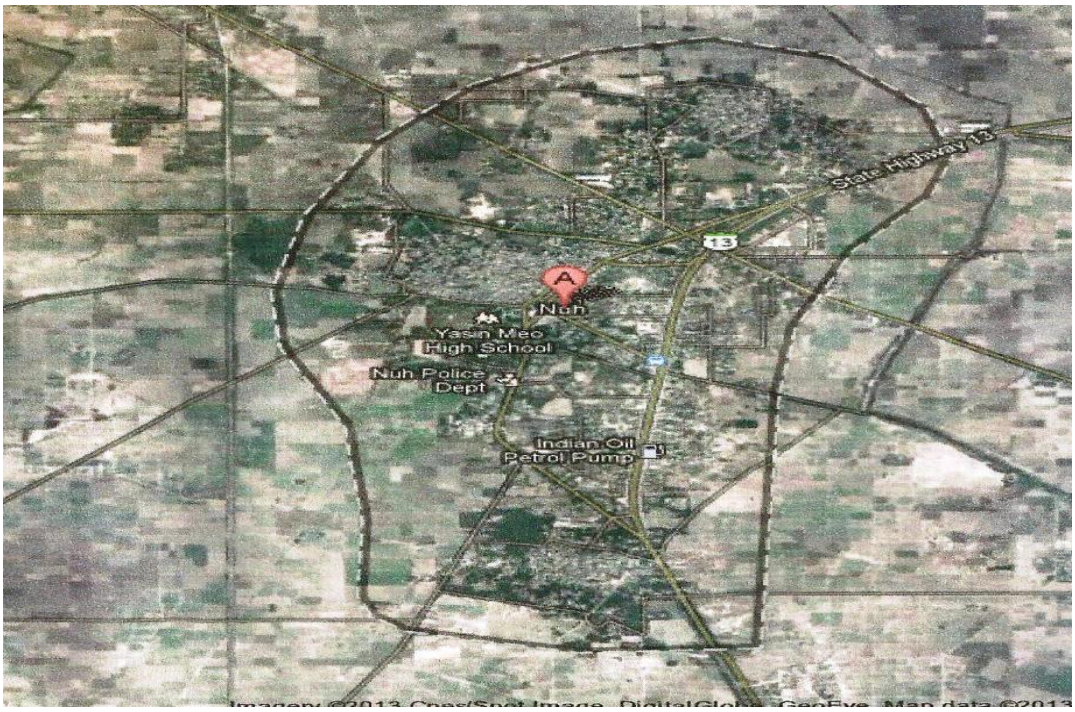
CHAPTER -2

DESCRIPTION OF PROJECT COMPONENTS

2.1 Project Background

Nuh is a district head quarter town in Mewat District with current (2012) estimated population of around 14732 (11039 as per Census 2001). It is located on the Gurgaon – Alwar road at a distance of 45 km from Gurgaon and about 78 km from Delhi. Geographically it is situated at 28° 06' 25'' N latitude and 77° 01' 02" E longitudes. Gurgaon district bounds it on north, Alwar district of Rajasthan to its south, Palwal district to its east and Aravali hills in west. 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. The plan indicating boundaries of Nuh town is given below.

2.2 Figure-2



Besides the entire population of Nuh, the project envisages coverage of adjoining 18 deficient villages to Nuh town. The total population for which the system has been designed is 1,30,720 which corresponds to year 2042 and a design period of 30 years. The system has been designed considering service levels of 135 liters/capita/day (lpcd) for the urban population and 70 lpcd for the rural population. The present water supply systems for the towns of Nuh and these adjoining villages 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 Nuh is determined to be 62 lpcd, which is as low as 54% of the prescribed level of 135 lpcd and villages on average level of 43 lpcd which is low as 39 % as per the Regional Plan-2021 of NCRPB.

In this context, the sub-project has been proposed by the PWD – PHED, GoH with the objectives in additions to meet its social responsibility to its residents:

(a) Improve infrastructural facilities and help create durable assets and quality oriented services in the identified towns and villages.
(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.
(e) To reduce water borne diseases in the area.
(f) To increase life span of residents.

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. This dedicated canal of 1000 cusecs has been constructed under the loan agreement from NCRPB, to supply drinking water to mainly Gurgaon town being developed by HUDA. The cost of industrial drinking water demand has been shared by HSIIDC. Similarly, PHED has shared cost to meet the drinking water demand of town and villages enroute this canal. The total length of this dedicated canal is 70 Km. There is a share of 50 cusecs of canal water to be supplied at Badli for drinking water to PHED. Presently, PHED needs 14.26 cusecs of canal water from this project for phase-i. Thus is no problem of getting canal water for this project.

The filtration system is designed for gross demand of 32 MLD at the distribution end corresponding to the intermediate year of 2027 while the intake works and transmission system are designed for the gross demand of 41 MLD corresponding to the ultimate design year of 2042 respectively. The total project cost is estimated to be Rs. 150.61 Crore (08/2012). The detailed project stands sanctioned by NCR PB in year 2112.

2.3 Description of sub-project components

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

2.3.1 Coverage

The sub-project will cover the entire population of Nuh town and eighteen adjoining villages. Total population to be served in the ultimate stage of the project is of the order of 130720.

2.3.2 Basis of process design

The population projections have been based upon the sub-project takes 2012 as the base year and adopts a design period of 30 years which corresponds to 2042. Two phases of 15 years each are envisaged for development of the infrastructure corresponding to the demand forecast for 2027 and 2042 respectively.

A schematic of the overall project is presented in Figure-3 below, which comprises of raw water intake works, raw water storage for 3 days near the intake, the treatment plant, a conventional treatment plant involving coagulation-flocculation, rapid sand filtration and chlorination, clear water pumping machinery and rising mains, a boosting station at Gurgaon -Pataudi road and ground level service reservoirs at Sehsola and distribution mains and supply mains to Nuh town and various villages, of different sizes as per service zones.

Selected critical components e.g., intake works, storage tanks, rising mains, clari flocculator, etc. are designed corresponding to the ultimate design period i.e. 2042 while the rest of the components, e.g., Filters, pumping machinery, service reservoirs, etc. which can be implemented in a modular approach have been designed for the intermediate stage of 2027.

2.3.3 Source of raw water

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 2004-08 as a dedicated source of supply for domestic and industrial drinking water requirements of Gurgaon, Manesar industrial township, Bahadurgarh, Farukhnagar, Pataudi, Haily Mandi and villages. Storage of canal has been proposed for three days only.

2.3.4 Intake works

Intake works will be located in Gurgaon canal near village Badli which is about 11 km from Farukhnagar and has access from the Gurgaon Farukhnagar road. The works will comprise intake pipe in canal, carrier channel 450M long of 1200 mm RCC pipe NP-3. Outlet in canal shall be fixed by canal authorities.

2.3.5 W.T.P.

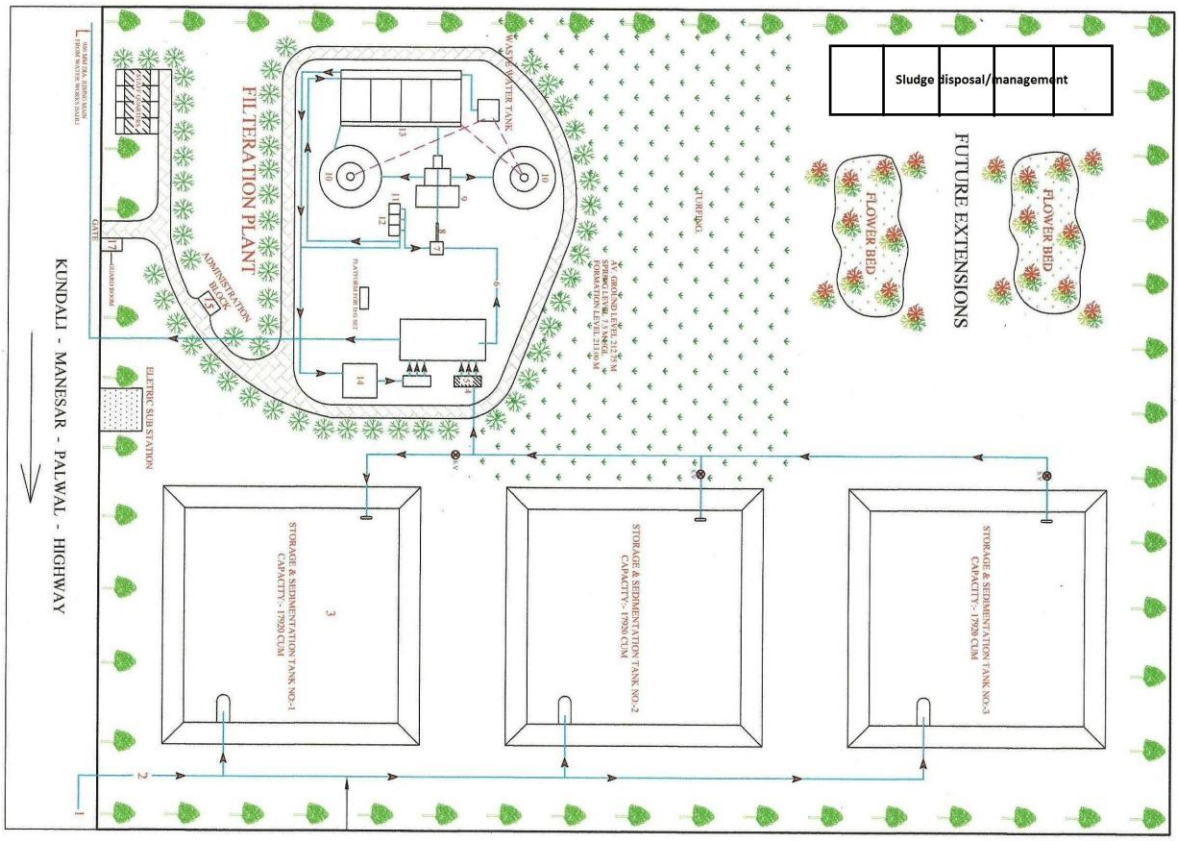
Canal water from canal shall be stored in raw water storage tank with 3 day detention capacity, suction well, pump house for raw water pumping and clear water pumping, rapid sand filtration unit, a conventional treatment plant involving clariflocculation, rapid sand filtration and chlorination, clear 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%), staff quarters, boundary walls, internal roads etc. The total cost of construction of this sub component is Rs. 25.55 Crore as per approved cost of project. Total land area required for construction of this composite WTP work is about 14 acres. This land is already acquired. Still a place has been earmarked for disposal of sludge in WTP area itself. Thus it will not create any serious environmental issue during maintenance.

The Preliminary design recommends inclusion of a clarifloculator which may generate alum sludges, with solid concentrations varying from 0.25 to 10%. Sludge which accumulates on the bottom of the sedimentation basins must be removed periodically for the following reasons: (i) to prevent interference with the settling process (such as re-suspension of solids due to scouring); (ii) to prevent the sludge from becoming septic or providing an environment for the growth of microorganisms that create taste and odour problems; and (iii) to prevent excessive reduction in the cross sectional area of the basin (reduction of detention time).

Backwash water will be diverted to open reservoirs and supernatant will be pumped back to water treatment plant. After reasonable accumulation of sludge in the reservoir, it will be pumped to sludge disposal/management area. No effluent will be released from the WTP.

2.3.6 FIGURE- 3

LAYOUT PLAN OF THE WATER TREATMENT PLANT AT BADLI



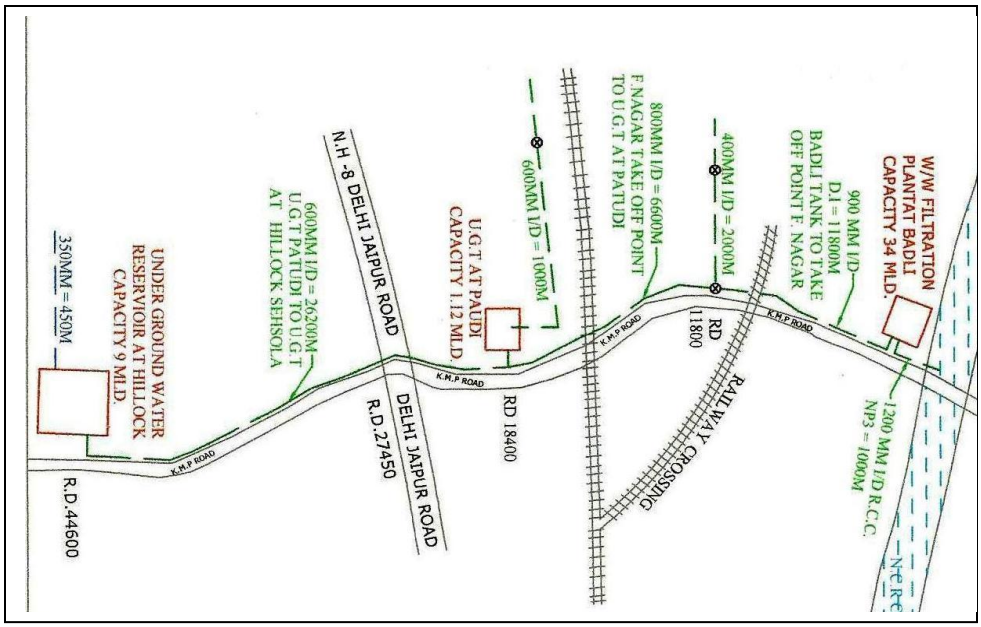
2.3.7 Rising main

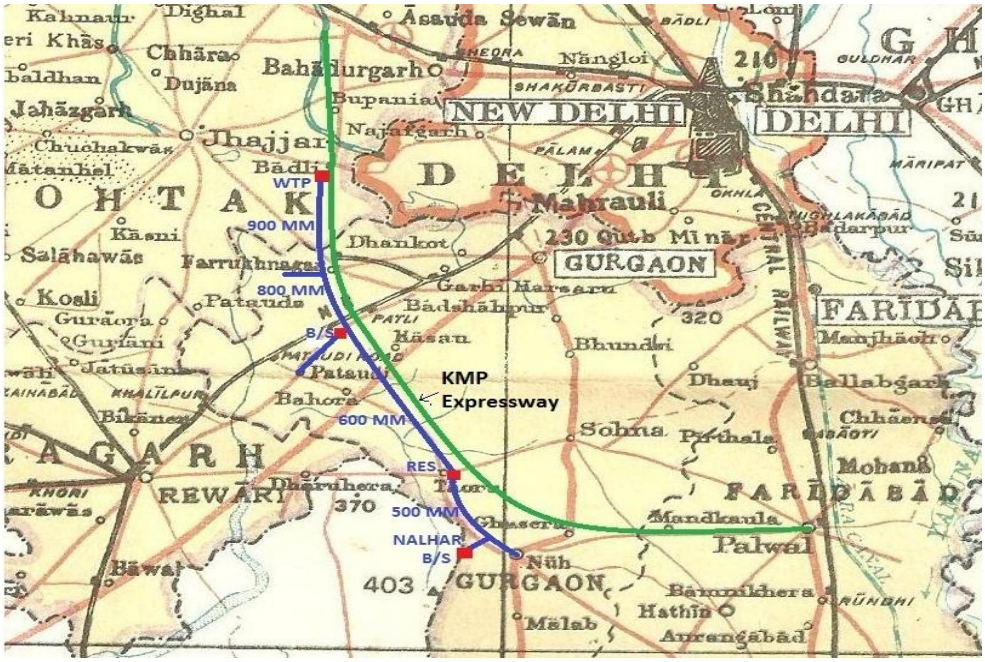
Treated water from water treatment plant shall be transported to Nuh by means of rising main to be laid with D.I. class K -9 pipes. 900mm i/d D.I. pipe shall move from water treatment plant upto 11800RD. A pipe for supply of treated water to Farukhnagar shall take off at this junction. Thereafter upto RD 18400, a pipe of 800 mm i/d will feed on line booster. From this booster a pipe line for supply of treated water to Pataudi and Haily Mandi will take off. From this booster a 600 mm i/d pipe shall be laid upto reservoir at hillock at RD 44600. This entire rising main shall be laid along KMP expressway. Thus no land acquisition is required for laying of this rising main. There is no plantation has been carried out in ROW of this KMP expressway as it is still under construction and yet to be handed over to forest department. Therefore no tree shall be cut and no permission of forest department is required as such. The total length of this rising main is 44600M of various sizes and pipe laying will be carried out through open excavation only and wherever there is railway line and highway crossings to be done, trenchless technology will be adopted for laying the pipe lines. This rising main has been designed for ultimate design year of 2042. The total cost of construction of this sub component is Rs. 57.73 Crore as per approved cost of project

The work will be executed strictly as per PWD specifications and latest ISI codes. Reinforced cement concrete work will be carried out as per IS 456 and IS 3370.

2.3.8 FIGURE- 4

LAYOUT PLAN OF RISING MAIN





2.3.9 BOOSTER

One on line booster is envisaged at RD 18400 to boost water pressure for supply to reservoir at RD 44600 near village Sehsola. This booster is located on Gurgaon – Pataudi road near KMP expressway. It will have underground reservoir of 1.12 ML, with a pump house having pumping machinery to pump water. From this booster a pipe to supply treated water to Pataudi and Haily Mandi is also drawn. Land required to construct this booster is about 1.5 acres, is under process of acquisition. The total cost of construction of this sub component is Rs. 2.32 Crore as per approved cost of project.

2.3.10 RESERVOIR

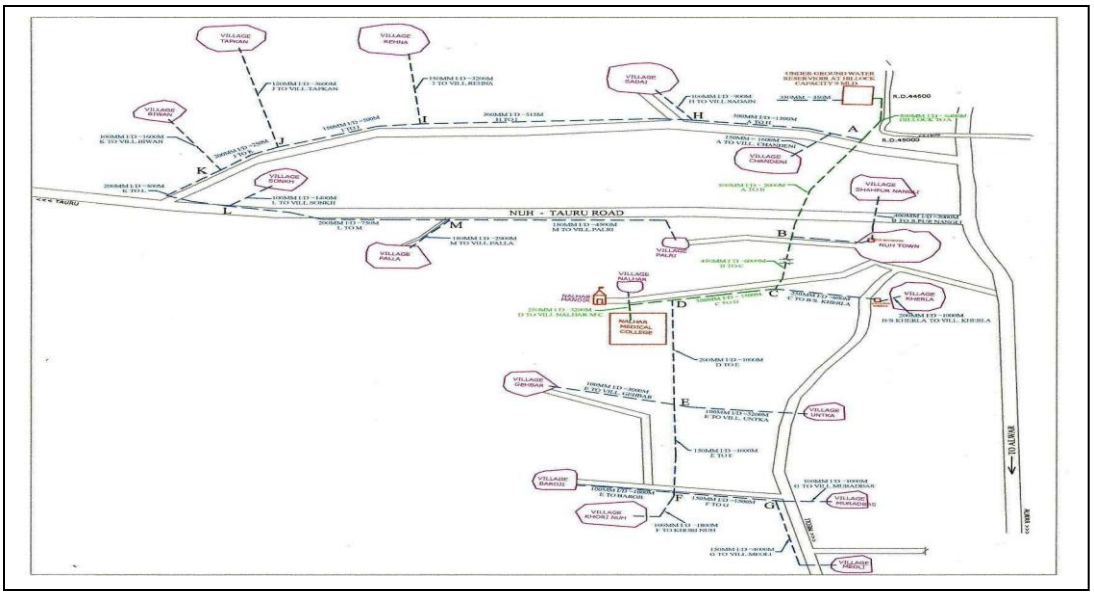
A reservoir is proposed on RD 44600 near village Sehsola. This will have an underground reservoir of 9000KL. From this reservoir water shall be supplied to Nuh town and 18 adjoining village through supply mains by gravity. Land required to construct this booster is about 1.5 acres, and belongs to Panchyat. The Panchyat has already given a resolution for handing over the said piece of land. As such there is no acquisition and displacement of any land owner. The total cost of construction of this sub component is Rs. 3.30 Crore as per approved cost of project.

2.3.11 Supply & Distribution mains

Water for supply to various consumers of Nuh town and 18 adjoining villages is drawn from reservoir at Sehsola through supply/ distribution mains to be laid with D.I. class K -9 pipes. A 350mm i/d pipe shall be laid connect existing distribution system of village Sehsola. Another supply main of 500mm i/d pipe shall be laid from this reservoir upto Nuh town. From this pipe line a pipe of 300mm i/d shall taken out to supply water to 7 villages. From this supply pipe distribution pipe for each village shall be drawn for connecting with existing distribution system of each village. Water shall be supplied in existing boosting station of Nuh town. No distribution system in Nuh town has been proposed under this project. A pipe of 450mm i/d is to be laid for supply of water to existing Nalhar medical college boosting station and remaining villages. The

total length of supply and distribution mains is 66.4 Km. All of these pipes are to be laid along the existing road network of PWD (B&R) GoH, so no land acquisition is required. The total cost of construction of this sub component is Rs. 19.50 Crore as per approved cost of project. Permission from PWD (B&R) and from forest department has already been sought.

2.3.12 FIGURE- 3
LAYOUT PLAN FOR SUPPLY/DISTRIBUTION MAINS



2.3.13 Water metering

Electromagnetic flow meters are proposed at all key locations, e.g., outlets of the clear water pumping station at WTP, booster pumping station, and all supply mains from reservoir Sehsola. 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.

2.3.14 Power supply

Power supply at the water treatment plant works will be made from Badli substation, located at a distance of about 11Km from WTP site. Independent substation of 11 KVA is proposed to be erected at WTP site. Power supply to booster shall be taken from Pataudi substation located at a distance of about 10 Km from booster site. Independent substation of 11 KVA is proposed to be erected at booster site. Therefore a complete system of development of 11KVA substation, transformers requisite building connecting cables, panel boards etc have been made in this project. As these are to be erected along the PWD (B&R) roads, so, no separate land is required to be acquired for this purpose. Adequate provision to this in the sub-project capital cost has been made.

2.3.15 Rain Water Harvesting

Rain water harvesting structures are proposed in all proposed buildings and premises.

2.3.16 Landscaping and Tree plantation

Landscaping and tree plantation are proposed in the sub project area wherever land is available.

2.4 Implementation Schedule

The sub-project will be implemented by the PWD-PHED over a period of 2 years from the date of awarding contract. Bid document has been sent to ADB and comments are received. It will take 1 month for ADB approval and 5 months for inviting bids. 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.

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 station, reservoir, 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 Nuh town. The components for adjoining 18 number villages will be implemented in the following 12 months. IEE and SRP reports stands submitted to NCRPB, once these are approved bid document shall be modified to extent of approved EMP in IEE report. The IEE and SRP reports are likely to be approved in March 2013. Bids can be invited in March/April 2013.

2.5 Occupational Health and Safety

Operation of Water Treatment Plant (WTP) involves various processes: pre-chlorination, alum dosing, flash mixing, flocculation, clarification, filtration, post-chlorination, wash water re-circulation and sludge disposal systems pre-chlorination, aeration, alum-mixing, flocculation, clarification, filtration, and disinfection. Chemicals such as Alum and chlorine will be used in the treatment processes. There is invariably a safety risk when considerable quantities of chlorine are handled (chlorine cylinders will be brought by trucks to the site, installed and operated to disinfect the water supplies). Since facilities are located in the urban area, precautions will thus be needed to ensure the safety of both workers and citizens.

The average dose of chlorine for pre-chlorination will be about 4mg/l and that for post chlorination will be about 2 mg/l. Chlorine equipment and storage will be provided in chlorination plant, which will be developed with all safety features and equipment to meet with any accidental eventuality. The chlorination plant will comprise a chlorinator, container store, vehicular access, mechanical container handling facility and a chlorine neutralization pit with a lime slurry feeder. The container store area and chlorinator room will be made in house and provided with continuous forced ventilation system as well as provided with facility for isolation in the event of major chlorine leakages. Safety equipment will be provided to the plant operators in the chemical house as well as in the chlorine house. Visible and audible alarm facilities also to be provided in the event of chlorine gas leak. A separate office building cum laboratory shall also be provided.

Training will be provided to the staff in safe handling and application of chlorine. This will be included as part of WTP turnkey contract. Each chlorinator will be provided with standard operating manuals for safe operation and as well as maintenance and repairs. With all the safety features included in the design, the health and safety risk due to handling chlorine will be negligible.

2.6 Provisions of IFB

The contract is of Design Build contract for all components. The Contract document submitted to NCRPB i.e. IFB includes the following major provisions:

i. Planning and design of all sub projects
ii. Procurement of material for erection
iii. Civil works at WTP
iv. Mechanical works
v. Electrical works
vi. Construction of Booster
vii. Construction of reservoir
viii. Laying of rising mains
ix. Laying of gravity main, supply mains & distribution mains
x. Operation and maintenance for 5 year along with one year defect liability period.

CHAPTER - 3

Description of the Environment

3.1 General

Nuh town is a district head quarter of Mewat district of Haryana. This district is one of the most backward and under developed district of Haryana. It is located in the foot-hills of Aravalli hills. It lies in the south of Gurgaon district of North Indian State of Haryana. This area comes under the National Capital Region (NCR). Nuh town lies at 28° 06' 25'' N latitude and 77° 01' 02" E longitude, at an altitude 190 m (623 feet) above mean sea level (MSL). Nearest airport is at Delhi (60 km). SH 13 connect this place with Gurgaon (45 km) and thereafter NH 8 connects Delhi (70 km) by road. This town is located in Seismic Zone IV.

3.2 Physical Environment

3.2.1 Terrain

Nuh block has conspicuously flat topography, though the Mewat district has diverse physiographic features due to plains on the one side and foot-hill extensions of Aravalli hills on another side. The Nuh block is an alluvial plain formed by the tributary of River Yamuna, namely Sahibi River. Soil available is loam and sandy. 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 185 m, in and around Nuh, as revealed by boreholes drilled in this block.

3.2.2 Climate

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 4°C in January to 47°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 Mewat district receives lesser rain-fall than the other part of the Haryana. Annual average rainfall in the district is 576 mm, with 28 normal rainy days in a year. Average rainfall in monsoon season is 445 mm (80% 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.

3.2.3 Soils

Major soil type in Mewat district is loamy sand. The general soil structure consists of sand, silt, gravel and kankar. Tropical and yellowish brown soils exist in the towns of the district, where the Nuh block is situated. The soil structure varies from sandy to silty having heterogeneous composition with frequent calcium carbonate layers at shallower depths. About 80% area is affected by salinity and alkalinity problems.

3.2.4 Geology

Mewat 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. Presently there is no mining activity in progress.

3.2.5. Land Use

Total geographical area of Mewat district is 1859.61sq km., with cultivable land of 1135.50 sq km. More than 65% of the land is used for agriculture (738.43 sq km.). Forest cover is little (40.74 sq km.). Mining is not permitted 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.

3.2.6 Surface Waters

There is no perennial river in the district. Gurgaon canal system supplies canal water from river Yamuna in this district. The quality of this canal water is almost at par with raw sewage water and as such no drinking water supply can be based on this water. This canal system takes off from Okhla barrage and it carries only the raw sullage from Delhi.

3.2.7 Ground water

At present Nuh and its surrounding villages relies on groundwater for sourcing its drinking water. However, the groundwater sources for this area are overexploited – use is greater than recharge. Aquifers in parts of Mewat district are yielding brackish water, making it unfit for consumption. In Mewat district fresh is available only at the foothills of Aravali range and has freshwater aquifers of limited thickness with very low discharge. These 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.

Ground water in this area occurs in unconfined and semi-confined condition. The upper zone of saturation consists of fine sand with weathered quartzite varying from place to place. The pre-monsoon depth of water level in the district ranges from 4.0 m bgl to 52 m bgl. The water level is deep in the southern part, eastern parts of the district. The depth of water level in Nuh block ranges between 5.0 m bgl to 10 m bgl. The altitude of water table ranges between 185 to 180 m above MSL. In North - eastern parts of the district, covering Nuh block, the water table slopes from north to 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 20435.10 ham and existing gross ground water draft for all users is 33786.45 ham. In Nuh block the net annual ground water availability is 4612.86 ham, while the gross annual draft for all uses is 13351.35 ham, showing over-exploitation of 289%. The shallow ground water of the district is alkaline in nature (pH 7.9 to 8.22) and is moderate to highly saline (EC 805 to 3410µS/cm). Ground waters in many areas show high TDS, hardness and fluoride contents, making the water unsuitable for drinking purposes. The mean fluoride concentration in drinking water samples taken at Nuh, Khori, Untka, Muradbas, Kherla and Rehna village were 0.7 to 1.0 mg/l (Standard limit – 1.5 mg/l). Similarly, ground water table is on decline in village from where ground water is pumped to Nuh for supply @ about 1.0 m/year. Water parameters recorded in underground reservoir water of surrounding villages chosen for supply of drinking water during April 2008 to September 2009 is shown in given in below in a Table 3.1.

Table -3.1

Site Name	TDS mg/ l	Total Hardness as CaCo3 mg/ l	Magnesium mg/ l	Chlorides mg/l	Fluorides mg/l	Alkalinity mg/l
Vill Khori	2100	760	134.40	760	0.74	180
Vill Untka	8000	2600	432.00	3520	1.00	560
Vill Muradbas	2100	990	160.08	300	1.00	2.20
Vill. Kherla	3500	1610	254.40	1360	1.00	340
Vill. Baroji	2250	820	184.80	1030	1.00	180
Vill. Rehna	2200	700	67.20	950	0.50	250

3.2.8 Ambient Air quality

Ambient air quality monitored near Nuh 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)

3.2.9 Ambient Noise Levels

The noise levels near Nuh block 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.

3.2.10 Ecological Resources

The land use is predominantly agricultural and there are little forests and protected areas in the vicinity of the Nuh town. Kotla lake and Aravalli hills are the sensitive sites located within 50km of Nuh town. 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).

3.2.11 Disasters

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.

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.

3.3 Social and Cultural Resources

3.3.1 Demographic profile

Total population of Nuh towns was 11039 (5.19 % of Nuh Tehsil). Nuh Tehsil has population of 212855 (19.54% of Mewat district). There is no notified scheduled tribe in the State. Demographic profile of the area is shown in the Table3.2:-

Table-3.2

DEMOGRAPHIC PROFILE OF NUH TOWN

		Haryana State	Mewat district	Percentage % (in reference to state)	Nuh tehsil	Nuh town
Total Area Sq Km		44212	1860	4.21	NA	NA
Total population		21144564	1089406	5.15	212855	11039
Urban population (%)		28.92	4.64	16.04	5.19	-
Rural population (%)		71.08	95.36	134.16	94.81	-
Density person/SqKm		573	729	127.23	NA	NA
Decadal population growth		19.90	37.94	190.65	-	-
Sex-ratio	T	877	906	103.30	898	-
	R	866	876	101.15	891	-
	U	847	861	101.16	894	887
SC population	T	4091110	59440	1.45	14576	1826
	R	3210917	50154	1.56	12750	-
	U	880193	9286	1.05	1826	1826
Children below 6 years of age	T	3335537	198134	5.94	53487	2187
	R	2482148	186742	7.52	51300	-
	U	853389	11392	1.33	2187	2187
Total Literacy Rate (%)	T	67.91	56	82.46	44.92	67.14
	R	63.19	42.64	6.68	43.64	-
	U	79.16	68.84	86.96	67.14	67.14
Female Literacy Rate (%)	T	66.77	37.60	56.31	24.98	54.79

		Haryana State	Mewat district	Percentage % (in reference to state)	Nuh tehsil	Nuh town
Total Area Sq Km		44212	1860	4.21	NA	NA
	R	49.27	22.60	45.87	23.23	-
	U	71.34	56.06	78.58	54.79	54.79

3.3.2 Industries

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. Milk production and animal husbandry is another major occupation. There is an industrial estate developed by Haryana Urban Development Authority at Rojka Meo in about 400Acres. About 100 unit are under production with annual turnover as Rs.277.64 crores. The total employment of workers in these industrial units is about 2000 persons.

Mining and allied operations are prevalent in this area. Growth of tertiary sector of industry induces further growth in this area.

3.3.3 Physical Infrastructure Services

Water supply, Sewerage system and storm water drainage system of the towns is at present developed and maintained and facilities are governed by the Water Supply and Sanitation wing of Public Works Department under an executive order of the GoH. Public Health engineering department is also responsible for supply of water supply and sewerage drainage system in villages. Partial sewerage system exists in Nuh. There are however some individual septic tanks also. The waste from the sewerage system and septic tanks and other open drains is finally collected at the disposal system. A sewerage treatment plant is under construction.

There is no primary solid waste collection system in Nuh town with the waste storage and collection points properly identified. Also, there is no at-source waste segregation. The solid waste management is with local Municipal committee. The solid waste so collected is transported to solid waste dumping lands for dumping at the outer skirts of the town. 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 Nuh is 4MT/day each.

Nuh block has a full fledged civil hospital with 50 beds and a medical college in village Nalhar. Both of these institutes are run by the Health department of the State. Fluorosis is becoming endemic in Nuh due to increase of concentration of fluoride in drinking water; therefore it is a necessity to change the source of water immediately.

3.4 ROW

All the proposed pipes shall be laid along the existing road network as per details given below in table 3.3:

Table-3.3

Sr.No.	Type of road	Ownership	ROW (M)	Remarks
1.	Expressway	KMP expressway	2040	Permission applied & under consideration
2	Sadai chandeni link road	PWD (B&R)	15	Permission applied & agreed in principal
3	Nuh Tauru road	PWD (B&R)	30	Permission applied & agreed in principal
4.	Nuh Nalhar link road	PWD (B&R)	15	Permission applied & agreed in principal
5	Nalhar to Baroji	Village road	10	Katcha village way to fields so no sanction required
6	Nuh Meoli Link Road	PWD (B&R)	15	Permission applied & agreed in principal
7.	Village link roads for individual village connection pipe	PWD (B&R)	15	Permission applied & agreed in principal

CHAPTER - 4

Identification of Environmental Impacts and Mitigation Measures

4.1 General

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.

Construction and operation are the two different activities in which the project interacts physically with the environment. So when assessing the effects of the processes, all potential impacts of project should be identified and mitigation is devised, so that the project is implemented successfully. Followings are identified impacts likely to affect this project.

4.2 Construction Impacts

4.2.1 Proposed water supply subproject involves the following:

(i) Construction of intake and intake channel

(ii) Construction of raw water tank

(iii) Construction of Water Treatment Plant of 32 MLD capacity

(iv) Construction of clear water tank

(v) Construction of raw & clear water pump house

(vi) Laying of rising main (46.4 km of DI of diameter 900-600 mm)

(vii) Construction of boosting station at RD 18600

(viii) Construction of reservoir at RD 46400

(ix) Laying of gravity, supply & distributions mains (66.4 Km of DI pipe of 100-500mm)

4.3 Construction Method

1. The intake canal, raw and clear water sump, raw and clear water pump houses and water treatment plant will be constructed on a selected site at Badli near Gurgaon water supply canal. All these facilities will be constructed with in this site.

2. Canal intake will be developed by creating an opening in the existing canal, and installing a discharge gate. As the canal is owned and maintained by Irrigation Department of Government of Haryana, as per the procedure it will be constructed/installed by Irrigation Department and the cost will be borne the PWD - PHED. Work will be carried out as per the standard construction practices of Irrigation Department. Construction will be undertaken by isolating the construction area by constructing a coffer dam into one side of the canal, while the water can flow uninterrupted through the remaining section. There is no closure of canal. Construction work will be completed in about a week.

3. An open intake channel of 1200 mm RCC pipe will be constructed from the canal to raw water tank. Design and construction will be such that the water from canal will flow by gravity into the tank. A trapezoidal tank with concrete/ brick lining will be constructed at WTP site for three days storage capacity. The total capacity of tank is 123 ML. The tank shall be excavated with mechanical means. The bed and side slopes shall be properly leveled manually. The bed and sides of this tank shall be lined with cement concrete/ brick lining. Reinforcement bars will be arranged over the bed and sides and the concrete, mixed on the site using the mixers, will be poured.

4. Two rectangular underground sumps (raw and clear water) will be constructed in the premises. Construction would involve creation of large cavity using back hoe diggers. Reinforcing rods would be placed in wooden casing and the concrete will be poured into to form bottom, walls and top of the sump. Necessary opening on the top of the sumps will be left for operational purposes.

5. A common pump house for Raw and Clear Water will be constructed adjoining to both the sumps. This will involve construction of a room with brick masonry walls and RCC roof slab. Pumps, brought to the site on a truck, will be installed using cranes or manually.

6. Water Treatment Plant will involve construction of following components.

Table 0-1**: Components of Water Treatment Plant**

S. No	WTP Component	Dimension Details
1	Cascade Aerator	8 m dia, 5 No. of Steps, 0.3 m rise of each Step
2	Collecting Launder	1 m (B) x 0.55 m (H)
3	Raw Water Outlet Channel	6 m (L) x 1 m x 1 m (D)
4	Parshall Flume	5.1 m (L) x 0.3 m (B) of Throat x 0.3 m (D)
5	Flash Mixer	2.3 m dia & 3.9 m (H)
6	Inlet & Outlet Chamber for Flash Mixer	1 m x 1 m each
7	Dia of Impeller & Size of Blades	0.9 m dia & 0.2 m x 0.50 m, 4 No.s.
8	Flocculator	10.5 m dia
9	Clariflocculator	31.4 m dia
10	Size of Launder	0.8m (D)x 0.8 m(D)
11	Sludge Well	1.7m dia & 6.2 m (D)
12	Clarified water channel to Filter House	5.0 m (L) x 1.2 m (B) x 0.8 m (D)
13	Size of each Filter Bed (4 No.s)	5 m (L) x 4.8 m (B) x 3.35 m (D)
14	Wash Water Channel	0.7 m x 0.5 m

15	Filtered Water Channel	1 m x 0.7 m
16	Size of each Trough (4 No.s.)	0.35 m (B) x 0.45 (D)
17	Size of Main Gutter	0.8 m (B) x 0.6 m (D)
18	Wash Water Storage Tank	1.4 LL
19	Chemical Solution for Alum (2 No.s.)	1.3 m x 1.3 m x 1.3 m each
20	Chemical Solution for Soda (2 No.s.)	1.9 m x 1.5 m x 1.3 m each
21	Chemical Solution for Lime (2 No.s.)	1.0 m x 0.8 m x 1.0 m each
22	Chemical House	8.5 m x 10 m
23	Filter House	20 m (L) x 15 m (B)
24	Sludge Drying Beds	Sufficient land is available for sludge management As per land availability and site conditions, the size will be finalised during detailed design stage.

7. The rising main from CWR to reservoir and distribution mains from reservoir to Nuh and villages will be buried in trenches adjacent to roads, in the un-used area within the ROW, at the edge of the road carriage way. The rising main will run along the KMP expressway, where there is enough space for the pipeline. However the distribution mains will be located in roads and Katcha way to fields, where in some places this area is occupied by the edges of shops and houses etc, so to avoid damage to property some trenches may be dug into the edge of the road.

8. Trenches will be dug using a backhoe digger, supplemented by manual digging where necessary. Excavated soil will be placed alongside, and the pipes (brought to site on trucks and stored on unused land nearby) will be placed in the trench by hand or using a small rig for the larger diameter pipes. Pipes will be joined by hand, after which excavated soil will then be replaced manually on beneath, sides and top of the pipe and compacted by a vibrating compressor. Where trenches are dug into an existing roadway, the bitumen or concrete surface will be broken by hand-held pneumatic drills, after which the trench will be excavated by backhoe, and the appropriate surface will be reapplied on completion.

9. Pipes are normally covered by 1.2 m of soil, and a clearance of 150 mm is left between the pipe and each side of the trench to allow backfilling. The maximum and minimum trench sizes for pumping main will be 2 m deep and 1.2 m wide (for 900 mm dia pipe) and 1.7 m deep 1.1 m wide (600 mm dia pipe). Similarly for distribution network, the maximum and minimum trench sizes will be 1.6 m deep and 1.1 m wide (for 500 mm dia pipe) and 1.4 m deep and 0.6 m wide (100 mm dia pipe).

10. The new distribution pipes shall connect either in existing boosting system or in existing distribution system. Therefore no internal pipe is to be laid in any of Town or villages so shall not affect the consumer connection. There is no replacement of AC pipes involved in scope of work. If there are any old AC pipes, these will be left as it is in the ground, and the new pipes will be laid without disturbing the AC pipes.

11. At three locations, trenchless technology will be adopted for laying the pipe line. One

is crossing of NH-8 and other two involves crossing of railway lines of Gurgaon-FarukhNagar, Gurgaon – Rewari. Standard construction methodology in trenchless technology will be adopted. Request has been sent to NHAI and railways for permission.

4.4 Impacts on Physical Resources

a. Generation of surplus soil and its disposal

1. The proposed waterworks campus comprising of intake channel, raw water storage raw water and clear water sumps with pumping station and water treatment plant, will be developed on a selected site of 5.8 ha in village Badli. Works require excavation for underground tanks and foundations for the water treatment plant. Excavation for the tank is expected to generate about 21,300 m^3 of soil. Since the WTP is proposed to be constructed on Turnkey basis, the detailed component specifications and as well as earthwork quantities are not available at this stage. Based on rough estimates with concept design, earthwork work excavation will be in the range of 1,000 – 1,500 m^3.

2. Thus the total earthwork excavation will in the quantum of 22,300 – 22,800 m^3 in development waterworks campus. There will therefore be quite large physical changes at the construction sites, and this quantity of waste could not be dumped without causing further physical impacts (on air quality, topography, soil quality, etc) at the point of disposal. However, this could be avoided by utilization of soil for any beneficial purposes. The site is located between two canals and is comparatively low lying, and therefore this quantity of soil will be utilized beneficially for raising the level of the campus, avoiding the need for disposal elsewhere.

3. Water Rising main and distribution pipeline construction work will involve simple excavation as it is to be done in open area. The impacts are not likely to be significant. It is estimated that the trench excavation for water supply lines will generate around 105,000 m3 of soil. After construction, a part of the trench will be occupied by the pipe and in the remaining portion excavated soil will be backfilled on beneath, top and sides of the pipes. This means that most of the soil will be retained for refilling the trench, and an estimated about 9,500 m3 of waste material will be left over and can be disposed of in the borrow pits of roads. The topography of the area is almost flat, and there are many areas which face problem in draining the rain water due to lack of slope. Surplus soil shall be utilized for the following beneficial activities in order priority:

- Utilize for filling the existing deep borrow pits of the road sections.
- Utilize in other construction activities implemented by government departments in or around Nuh.
- Utilize in filling of earth in KMP expressway
- Provide waste soil to local people for filling up low lying areas.

b. Interference with surface drains and groundwater table

4. The other physical impact commonly associated with large-scale excavation (effects on surface and groundwater drainage) should again be minimal by the fact that this work will be conducted in the dry season. As the depth of water table in the city is deep (about 40m) the trench excavation may not interfere with the groundwater drainage. Rainfall in Nuh is limited and concentrated during the monsoon months of July-September. During the rains, there is possibility of water accumulation in open trenches excavated for pipelines. The contractor

therefore shall implement the following:

- Avoid scheduling of excavation work during the monsoon months
- Complete pipe laying work in excavated stretches and refill before onset of monsoon
- In unavoidable circumstances, protect open trenches from entry of rain water by raising earthen bunds with excavated soil and ensure that drains are not blocked with excavated soil

c. Dust and noise generation from excavation & construction works

5. The work will almost certainly be conducted in the dry season, so there is also a lot of potential for the creation of dust, from the excavation of dry soil and its storage, and leveling on the ground. Action will therefore be needed to reduce physical impacts at both the construction and disposal sites, by controlling dust and reducing the amount of material to be dumped. The Contractor should therefore be required to:

- Cover or damp down by water spray on the excavated mounds of soil to control dust generation;
- Apply water prior to levelling or any other earth moving activity to keep the soil moist throughout the process;
- Bring the material (aggregate) as and when required;
- Ensure speedy completion of work – trench excavation, laying of pipeline and refilling, to remove surplus soil as soon as possible;
- Use tarpaulins to cover loose material that is transported to and from the site by truck.
- In case of surplus soil is provided for other departments or private persons, it will be the responsibility of contractor to ensure that it proper handling, transport & utilization
- Control dust generation while unloading the loose material (particularly aggregate) at the site by sprinkling water and unloading inside the barricaded area
- Clean wheels and undercarriage of haul trucks prior to leaving construction site
- Stabilize surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition where loaders, support equipment and vehicles will operate
- Don't allow access in the work area except workers to limit soil disturbance and prevent access by fencing

6. In the villages some of link roads are of cement concrete. As most of these link roads are narrow and there may be no earthen shoulder available on the edge of the road to lay the pipeline, it is necessary that the pipes are laid into the road requiring cutting/ breaking open of road surface. This activity will certainly generate noise and vibrations. The following measures therefore shall be implemented to reduce the impact:

- Provide prior information to the local public about the work schedule
- Do not conduct noise generating activities in the night
- Ensure that there are no old and sensitive buildings that may come under risk due to the use of pneumatic drills

- Employ manual methods, where required

c. Loss of fertile top soil

7. Development of waterworks campus on agriculturally fertile land will lead to loss precious fertile top soil. Total area of the site is 6.4 ha. The top soil of about 1 ft depth (0.3 m) may removed and preserved separately for use within the site for plantations and the surplus soil may be given to surrounding farmers.

d. Mining for construction materials

8. Large quantities of construction material like sand and aggregate will be required for WTP and reservoir constructions. As the excavated soil will be used for refilling trenches, pipeline construction will require minor quantities. Normally material for Nuh is procured from mines i.e. sand from Delhi (Yamuna River), and aggregate from Mohindergarh and Bhiwani District. To avoid any impacts related to mining of material, the contractor will be required to obtain sand and other mining material required for construction only from quarries licensed by the Directorate of Geology and Mining, Government of Haryana.

e. Impact on Ecological Resources

9. There are no significant ecological resources in the town (protected areas or rare or important species or habitats), so the construction should have no ecological impacts. Tree cover in the Nuh area is very limited. Roadside trees should not be removed unnecessarily to lay pipelines, and to mitigate any such losses the Contractor should be required to plant and maintain two trees (of the same species) for each one that is removed.

4.5 Impact on Economic Development

a. Land acquisition & resettlement

10. The Waterworks and booster Campus will be constructed over a private land of 6.4 ha, which is presently under agricultural use. The acquisition of private land is necessitated due to non-availability of vacant government land in and around Badli. The site is located ideally adjacent to the canal for development of canal based waterworks. The PWD - PHED identified this site.

11. The issues related to Involuntary Resettlement were assessed by a parallel process of resettlement planning and will be compensated by measures set out in detail in the Resettlement Framework. Therefore it is necessary that:

- Resettlement Plan prepared for the subproject is implemented in full and all its recommendations are complied with.

12. Pipeline will be laid in the ROW of existing roads (either adjacent to the road, or beneath the road surface in narrower streets). There should thus be no need to acquire land from private owners, so there should be no direct effect on the income or assets of landowners, or the livelihoods of tenants.

b. Impeded access and loss of business

13. During the laying of rising main and distribution lines, particularly in narrow streets and streets with on street commercial activities, there may be temporary disruption or relocation of hawkers and vendors.

14. Although most of the work will not require land acquisition it could still have economic impacts, if the presence of trenches, excavated material, workers and machinery

discourage customers from visiting shops and other businesses, which lose income as a result. These losses however will be short in duration as work at each site should be completed in about week. Implementation of the following best construction measures will reduce the inconvenience and disturbance to the public:

- Informing all residents and businesses about the nature and duration of any work well in advance so that they can make necessary preparations;
- Requiring contractors employed to conduct these works to provide wooden planks across trenches for pedestrians and metal sheets where vehicle access is required;
- Increasing workforce to complete the work in a minimum possible time

c. Disruption to other infrastructure services

15. During the laying of water supply lines along the roads, various infrastructure services may be affected. It is therefore required to implement following measures to avoid or minimize the impact during construction:

- Identify the services to be affected in each zone and notify the respective agencies (electricity, telephone, etc) about the construction work and if there is any need for shifting
- Coordinate with respective agencies and provide prior information to public about the disruption in services during construction; this can be announced via mass communication systems like local/vernacular news papers.
- Provide alternative arrangement for disrupted services
- During construction, the water supply service will be affected. In case of water supply being affected for more than a day, alternative water supply may be provided through mobile tankers.

16. Transport is another type of infrastructure that will be affected by the pipeline laying work, as in the narrower roads there is not enough space for excavated soil to be piled off the road. The road itself may also be excavated in places where there is no available land to locate pipes alongside. Traffic will therefore be disrupted, and in some very narrow roads the whole road may need to be closed for short periods. Following measures can potentially avoid traffic disruptions:

- Conduct work during light traffic; explore night working schedule ensuring workers and public safety
- Plan work such that trench excavation, pipe laying, and refilling including compacting, at a stretch is completed in a minimum possible time
- Provide for immediate consolidation of backfilling material to desired compaction to avoid future settlement risk - this will allow immediate road restoration and therefore will minimise disturbance to the traffic movement
- Do not close the road completely, ensure that work is conducted onto edge of the road; allow traffic to move on one line
- In unavoidable circumstances of road closure, provide alternative routes, and ensure that public is informed about such traffic diversions
- In case of closure of important roads, provide information to the public through media – daily news papers and local cable television (TV) services, about the need and schedule of road closure, and alternative routes

17. At all work sites public information/caution boards shall be provided - information shall inter-alia include: project name, cost and schedule; executing agency and contractor details; nature and schedule of work at that road/locality; traffic diversion details, if any; entry restriction information; competent official's name and contact for public complaints.

18. It is inevitable that there will be an increase in the number of heavy vehicles in the area (particularly trucks carrying construction materials and removing waste), and this could disrupt traffic and other activities. These impacts will therefore need to be mitigated by:

- Careful planning of transportation (material and waste) routes in coordination with the Traffic Police to avoid sensitive areas as far as possible, including narrow streets, congested roads, and other important area
- Scheduling the transportation of waste to avoid peak traffic periods

19. There should be no effects on other features with economic implications (such as infrastructure, industry and commerce), as there are none of these facilities on these sites. There should also be no effects on traffic or transport, as all of the other works will be conducted on small parcels of government land.

4.6 Impact on Social and Cultural Resources

a. Damage/disturbance to historical sites

20. There are few protected historical monuments in Nuh. As no internal pipe line in the town or villages is proposed in this sub project so there may not be a risk with any work involving ground disturbance could uncover and damage archaeological and historical remains. There are monuments within the subproject area (Chuhi Mal ki Haveli). Works will not disturb this site as it is located in the old city area. Excavations for laying of pipelines within 300 m of sites requires permission from ASI. However, no impacts on these sites are anticipated considering the present development around the sites. However, it will be necessary to adopt a series of measures, to both avoid sensitive sites and recognize and protect any chance discoveries. These include:

- No infrastructure, except unavoidable water supply pipe lines, shall be constructed within the 300 m of sites.
- Obtain permission from ASI for laying of pipelines within 300 m of sites.
- Ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved.
- If any chance finds are recognized, the Contractor should:
  - Stop work immediately to allow further investigation if any finds are suspected;
  - Inform PWD - PHED; call in the ASI if a find is suspected, and taking any action they require to ensure its removal or protection in situ.

21. The water pipeline work likely to disturb some modern-day social and cultural resources, such as schools, hospitals, temples etc. Impacts will include noise, dust, and interrupted access for pedestrians and vehicles. Mitigation will therefore be needed to protect these resources and to enable usage by local people and visitors to continue throughout the construction work. This will be achieved through several of the measures recommended earlier, including:

- Avoiding working at sensitive times,
- Limiting dust by removing waste soil quickly, bringing sand to site only when necessary, covering and watering stockpiles, and covering soil and sand when carried on trucks;
- Increasing the workforce in sensitive areas to complete the work quickly;
- Providing wooden bridges for pedestrians and metal sheets for vehicles to allow access across open trenches where required (including access to houses);
- Using modern vehicles and machinery with standard adaptations to reduce noise and exhaust emissions, and ensuring they are maintained to manufacturers' specifications.

b. Public & worker safety

22. There is invariably a safety risk when substantial construction such as this is conducted in an urban/ rural area, and precautions will thus be needed to ensure the safety of both workers and citizens. The Contractor will be required to formulate and implement health and safety measures at construction sites, which should include such measures as:

- Following standard and safe procedures for all activities – such as provision of shoring in trenches where required in deeper trenches of more than 2 m
- Consulting the town/ village authorities to identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills for cutting roads;
- Excluding the public from the site – enclosing the construction area, warning boards and sign boards
- Ensuring that all workers are provided with and use appropriate Personal Protective Equipment (helmet, hand gloves, boots, masks etc);
- Maintaining accidents reports and records

d. Economic benefit

23. There could again be some short-term socio-economic benefits from the construction work if local people gain employment in the workforce. To ensure that these benefits are directed to local people, the Contractor should be required to employ as much of his labour force as possible from the local communities in the vicinity of construction sites. Drawing of majority of workforce from local communities will avoid problems that can occur if workers are imported, including social conflicts and issues of health and sanitation due to labour camps. If temporary labour camps are to be provided; Contractor should ensure that they are maintained well with proper water supply and sanitation facilities.

4.7 Operation & Maintenance Impacts

24. Regular operation of water supply system involves water abstraction, water treatment including chlorine injection into water supplies, pumping to OHSRs, and water distribution to consumers.

25 With the proposed canal based (surface water) water supply system, the existing groundwater based system will be discontinued. The water supply will increase from present 16 MLD to 32 MLD and ultimately to 41 MLD.

a. Impacts on Physical Resources

26. One of the main risks of the water supply system improvement through increased abstraction is that the source will be used unsustainably, at a rate that is above the level of natural replenishment, and that the source becomes depleted as a result. The water will be sourced from GWSC, a dedicated canal of West Jamuna Canal (WJC) system. The total extraction is about 1.4 % of total flow, and this will be within the limits of water allocated[3] to Nuh Water supply. Therefore no impacts on source sustainability envisaged. . It should also be noted that water conservation measures included in the subproject (in particular the replacement of leaking distribution mains and faulty house connections) should significantly reduce system losses, and thus limit the volume needed.

27. A main requirement for O&M will be regular operation of Water Treatment Plant (WTP) which involves various processes: pre-chlorination, alum dosing, flash mixing, flocculation, clarification, filtration, post-chlorination, wash water re-circulation and sludge disposal systems pre-chlorination, aeration, alum-mixing, flocculation, clarification, filtration, and disinfection. Water will flow in gravity from canal to raw water sump from where it is pumped to inlet chamber of the WTP. Water will flow in gravity from the inlet chamber through all components of WTP and finally the treated water flows into the clear water sump in the premises. Chemicals such as Alum and chlorine will be used in the treatment processes.

28. Water treatment process will generate waste, which will comprise of the following: (i) sludge from sedimentation of particulate matter in raw water, flocculated and precipitated material resulting from chemical coagulation, residuals of excess chemical dosage, plankton etc; and waste from rinsing and back washing of filter media containing debris, chemical precipitates, straining of organic debris and plankton.

29. In the project design, it is proposed to provide recirculation system for wash water. For this purpose, wash water will be collected in two open tanks for alternative use, with a storage capacity of one day wash water in each tank. The settled water will be pumped back into the Inlet chamber and re-circulated with the raw water. Sludge from these tanks and also from the clarifier will be collected in a sludge tank. Sludge from the tanks will be sent to sludge drying beds, and the dried sludge will be sent either for land filling in depressions of WTP or used as soil conditioner.

30. Another main requirement for maintenance of the water supply infrastructure will be for the detection and repair of leaks. The usage of good quality new pipes should mean that pipeline breaks are very rare, and that leaks will be minimal. The repair of household connections and the provision of new connections to increase the number of people supplied should greatly reduce the incidence of illegal connections, which are often a major source of leaks. Leaks will be detected and rectified during operation phase. Repairs will be conducted in essentially the same way that the pipes were laid. Trenches will be dug to reveal the leaking area and the faulty connection will be re-fitted, or the pipe will be removed and replaced if necessary.

31. An important aspect of increased water supply is that of increased sewage generation, which needs to be treated and disposed properly without causing any impacts. With the

[3]Source: DPR of Irrigation department for construction GWSC under loan from NCPB.
As per approved DPR of Gurgaon water supply channel by NCRPB, there is provision 250 cusecs for PHED for providing drinking water in towns and villages enroute GWSC and 50 cusecs to be given at Badli.

current rate of water supply, without the project the gross water supply to the sub-project area is 16 MLD. With the project this will increase to 32 MLD and ultimately to 41 MLD. The sewage generation (85 percent of net water supply at consumer end) with the current situation will be 13.6 MLD, while with the project implementation same will increase to 27.2 MLD and ultimately to 34.85 MLD.

32. Underground sewerage system in Nuh was mostly developed under state plan, a state government sponsored program to abate the pollution in the town. At present, in the Nuh town, the underground sewerage system is available in about 70% area. In the uncovered areas, septic tanks and open drains serve the purpose. At present there is one STPs of capacity 4 MLD to treat and dispose the sewage to acceptable standards under construction.

33. It is therefore necessary that (i) the sewerage system is extended to uncovered areas; (ii) the illegal entry of untreated wastewater into open drains and sewers is controlled, and (iii) sewage treatment capacity is gradually increased to meet the demand. Considering these issues, under NCRPB loan has been sanctioned for Rs 1027.00 Lacs and works are under progress.

34. In the consultation meeting conducted in Nuh as part of this IEE preparation, the stakeholders were concerned about the sewerage system in the town, and requested the implementing agency to implement the sewerage system master plan along with water supply master plan. The implementing agency replied that it will be implemented under Loan from NCRPB, project already stands submitted.

b. Impacts on Ecological Resources

35. As there are no significant ecological resources in or around the town, any repairs or maintenance work and regular operation of WTP can be conducted without ecological impacts. The WTP design includes necessary facilities for safe disposal of back wash water (recirculation) and sludge (sludge drying beds), and therefore no impacts are anticipated.

36. The sewerage system needs immediate expansion and improvement not only to cater the present situation but also for the increased sewage generation resulting from implementation of this subproject. The current sewerage system facing problems in terms of coverage and entry of untreated/partially treated industrial effluent, etc. In uncovered areas, domestic and industrial wastewater illegally enters into the open drains and flows into Nuh Drain. It is therefore important to improve the sewerage system and control the entry of industrial wastewater into sewers and open drains to protect the environment.

37. A major ecological benefit of this project will be on groundwater regime. As presented in the baseline section, groundwater in and around Panipat is over exploited and in some areas the quality has become poor. This subproject is designed with surface water (an artificial canal) as source, eliminating the dependence on groundwater.

c. Impacts on Economical Development

38. Although network repairs could result in shops losing some business if the work means that access is difficult for customers, any losses will be small and short-lived and will probably be at the level of normal business fluctuations. Nevertheless, implementation of the following best construction measures will reduce the inconvenience and disturbance to the public:

- Informing all residents and businesses about the nature and duration of any work well

in advance so that they can make preparations if necessary;

- Requiring contractors employed to conduct these works to provide wooden walkways across trenches for pedestrians and metal sheets where vehicle access is required;
- Consulting the Traffic Police regarding any such work so that it can be planned to avoid traffic disruption as far as possible, and road diversions can be organised if necessary.

d. Impacts on Social and Cultural Resources

39. The operation & maintenance work will confine to within the facilities footprint, and no new areas will be disturbed or excavated. Therefore there are no likely impacts or risks.

40. The citizens of the town and villages will be the major beneficiaries of the improved water supply, as they will be provided with a constant supply of better quality water, piped into their homes. This should improve the social capital of the city, and individual and community health and well-being. Diseases of poor sanitation, such as diarrhea and dysentery, should be reduced, so people should spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health.

CHAPTER - 5

Institutional Requirements

5.1 Institutional Arrangements

Following agencies are involved in execution of this sub project of water supply Nuh.

i. NCRPB: National Capital Region Planning Board is the funding agency for the project.

ii. Implementing Agency (IA): Implementing Agency of the Project will be Public Works Department-Public Health Project Division no. 1 Nuh. IA will be responsible for the project implementation. Operation & maintenance will also be the responsibility of the IA.

iii. Design and Supervision Consultants: Implementing Agency will be assisted by Design and Supervision Consultants (DSC) in tendering, and reviewing and revising designs during the construction, if required, and supervising the construction to ensure quality.

iv. Construction Contractors: IA will appoint Construction Contractors (CC) to build the infrastructure elements.

The PHED, as the Implementing Agency (IA) will undertake all actions for the implementation of the project. Implementing the project according to and incompliance with the policies the funding agency, NCRPB, will be the responsibility of the Implementing Agency (IA). The Environmental and Social Management Cell (ESMC) of NCRPB will deal with environmental and social safeguard issues. ESMC would guide and monitor IA in complying with its ESMS and Policy.

The ESMC will be housed inside the appraisal function of NCRPB and will have two distinct sub-functions, i.e. managing environmental safeguards and social safeguards. ESMC will be provided with one full-time staff-safeguards officer, who will look after the day-to-day activities related to the safeguard compliance. Safeguard Officer will be responsible for both environmental and social safeguard functions. Based on the necessity, the Safeguards Officer will source expertise from outside/external consultants on a case-to-case basis.

ESMC will review and approve IEE, oversee disclosure and consultations, and will monitor the implementation of environmental monitoring plan and environmental management plan wherever required. The Construction Contractor (CC) will implement mitigation measures in construction. IA or DSC will monitor the implementation of mitigation measures by the CC. ESMC will oversee the oversee the implementation of EMP. Implementation of mitigation and monitoring measures during the operation and maintenance (O&M) stage will be the responsibility of the implementing agency.

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.

5.2 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
- 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.

CHAPTER -6

Environmental Management Plan

6.1 General

1. The proposed subproject and its components, the baseline environmental profile of the subproject area, the anticipated environmental impacts and appropriate mitigation measures to avoid/ reduce/ mitigate/compensate for the identified impacts have been discussed in detailed in earlier sections.

2. An Environmental Management Plan is developed for implementation listing the impacts, appropriate mitigation measures, delegating the responsibility of implementation to concerned agencies. This is shown in the following Table 6-1

3. A program of monitoring will be conducted to ensure that all parties take the specified action to provide the required mitigation, to assess whether the action has adequately protected the environment, and to determine whether any additional measures may be necessary. Regular monitoring of implementation measures by construction contractors will be conducted by the Implementing Agency. Periodic monitoring and overseeing of implementation of mitigation measures will be conducted by the ESMC of NCRPB. Monitoring during operation stage will be conducted by the Operating Agency.

4. Most of the mitigation measures are fairly standard methods of minimizing disturbance from building in urban areas (maintaining access, planning work to minimize public inconvenience and traffic disruptions, finding uses for waste material, etc). Monitoring of such measures normally involves making observations in the course of site visits, although some require more formal checking of records and other aspects.

5. Table 6.2 shows the proposed Environmental Monitoring Plan (EMP) for this Project, which specifies the various monitoring activities to be conducted during different phases of the project. The EMP describes: (i) mitigation measures, (ii) location, (iii) measurement method, (iv) frequency of monitoring and (v) responsibility (for both mitigation and monitoring).

6. 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 6.2 The agencies that are responsible for implementing the measures that are required to be undertaken have been identified.

Table – 6.1 Environmental Management Plan

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
Preconstruction						
Land acquisition and involuntary relocation: *Description*: Acquisition of 5.8 ha of land for WTP, and0.60 ha of land for construction of booster.	M	P	• Implement compensatory measures as recommended by the Resettlement Plan prepared in compliance with NCRPB ESMS • Land acquisition and resettlement measures must be implemented before the signing of contract for civil works	PWD - PHED	WTP & booster Sites	Part of RP Cost
Impacts due to increased water extraction and change in source. The subproject is designed with, dedicated GWS Channel designed with no closure as source. The current source of groundwater, which is depleting & degrading fast, will be discontinued. *Description*: The estimated demand of Nuh is 16 MLD (2012), 32 MLD (2027) and 41 MLD (2042). This subproject will cater to Farukhnagar, Pataudi, Haily Mandi, Nuh and 18 adjoining villages to Nuh. PWD Irrigation has already recommended the outlet of 14.36	I	P	• Obtain State government's (Irrigation Department) allocation and approval for width drawl of 14.36 cusecs (32 MLD) to meet the ultimate demand of 2027. WTP site already stands acquired and booster site under process of acquisition. • All existing tube wells of PWD – PHED in Nuh must be closed once the canal-based system is functional • All tube wells used by individual households must also be closed. Although PWD - PHED has no control, it shall liaison with Groundwater & mines department and district administration to encourage users to close down.	PWD - PHED	NA	-

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
cusecs for sanction to Government.						
Risks of non-availability of water due closure of canal (scheduled or unscheduled); *Description*: This is a dedicated canal without any canal closure. However, to meet contingency, three days storage of raw water have been kept at WTP. Therefore, there is no perceived risk of non-availability of water.	L	P	• Outlet of 14.36 cusecs is with govt. for sanction.	PWD – PHED	NA	-
Permission and approvals for construction, disclosure of IEE and implementation of EMP	-	-	• All clearances, permission and consents required by Contractor and PWD-PHED for construction work will be obtained prior to commencement of civil works • It will be the responsibility of contractor to obtain clearances necessary for construction work • In case of clearances required to be obtained by PWD-PHED for the construction work, contractor to prepare all supporting documentation and assist PWD-PHED to obtain required clearances • A copy of the IEE shall be kept on-site and disclosed in NCRPB and PWD-PHED websites. • PWD-PHED will review and	PWD – PHED and Contractor	NA	-

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
			approve contractors' location, selection design and layout of construction camps; drinking water availability and water management; establishment of hot mix plants, crushers, etc., if required; identification of disposal sites; quarry operations; and batching plants. • The contractor shall appoint one environment safeguard supervisor who will be responsible for the implementation of EMP, coordinating with PWD-PHED, and consultations with interested/affected parties, reporting, and grievance redressal on a day-to-day basis.			
Pre-Construction Activities by Contractor						
Construction Camps – Location, Selection, Design and Layout	L	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	Contractor / Supervision Consultant		

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
			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 Approval should be taken from PWD-PHED for contractors location, selection design and layout of construction camps.			
Drinking water availability and water arrangement	L	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		

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
Identification of disposal sites	P	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		
Quarry Operations	P	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		
Construction						
Excavation will produce large quantity of waste soil, which needs proper disposal. *Description*. Laying of pumping mains and distribution network is estimated to produce about 19,500 m3 of waste soil,	L	P	Utilize surplus soil for following activities in order priority: • Utilise for filling deep borrow-pits along roads section. • Allow KMP express way to	CC	Rising main, supply & distribution network sites	Part of standard contract

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
which needs proper disposal. This soil shall be disposed off in the borrow-pits of the road section.			utilise in their earth work. • Utilize for raising the ground-level of WTP & Boosters sites • Utilize in other construction activities implemented by government departments around Nuh. • Provide waste soil to local people for filling up low laying areas.			
Water accumulation in trenches during rains and related impacts	L	T	• Avoid scheduling of excavation work during the monsoon months • Complete pipe laying work in excavated stretches and refill before onset of monsoon • In unavoidable circumstances, protect open trenches from entry of rain water by raising earthen bunds with excavated soil and ensure that drains are not blocked with excavated soil	CC	All construction sites	Part of standard contract
Risk of contact with AC pipes	L	T	• No AC pipes shall be laid under the project	CC in coordination	All construction	Part of standard

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
			• If there are any existing AC pipes to be replaced, it should be replaced with non-AC pipes; and the AC pipes should be left underground as it is without disturbing the pipe. • The new replacement pipe will be laid away from the existing AC location.	with PHED	site	contract
Sign Boards, Name boards showing project details at site			• Put up visible signs showing duration of construction activities, contact details of focal persons from HSRDC and contractor, contact numbers in case of complaints/grievances	Contractor	All construction sites	Part of standard contract
Dust nuisance due to construction *Description*. Earthwork excavation, refilling, handling and transportation of construction materials (like sand and aggregate), and handling, transportation and disposal of waste soil will produce dust if it is not done properly. Total quantity of earthwork involved in laying/replacing of distribution and rising main is about 270,000 m^3, including 19,500 m^3 of surplus soil for disposal.	M	T	• Cover or damp down by water spray on the excavated mounds of soil to control dust generation; • Apply water prior to leveling or any other earth moving activity to keep the soil moist throughout the process; • Bring the material (aggregate) as and when required; • Ensure speedy completion of work – trench excavation, laying of pipe and refilling, to remove surplus soil as soon as possible; • Use tarpaulins to cover	CC	All construction sites	Part of standard contract

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
			loose material that is transported to and from the site by truck. • In case of surplus soil is provided for other departments or private persons, it will be the responsibility of contractor to ensure that it proper handling, transport & utilization • Use tarpaulins to cover loose material/soil that is transported to and from the site by truck • Control dust generation while unloading the loose material (particularly aggregate) at the site by sprinkling water and unloading inside the barricaded area • Clean wheels and undercarriage of haul trucks prior to leaving construction site • Stabilize surface soils where loaders, support equipment and vehicles will operate by using water and maintain surface soils in a stabilized condition where loaders, support equipment and vehicles will operate • Don't allow access in the work area except workers to limit soil disturbance and prevent access			

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
			by fencing			
Generation of Pollution/noise and vibrations from excavation *Description*. High noise/vibration activities like rock blasting/pile construction are not anticipated. However, activities like breaking of CC/BT road surface using pneumatic drillers for laying pipelines may creates noise & vibration	L	T	• Provide prior information to the local public about the work schedule • Do not conduct noise generating activities in the night • Ensure that there are no old and sensitive buildings that may be in risk due to use pneumatic drills • Employ manual methods, where required • Clean up the affected area immediately at own cost of contractor and to the satisfaction of the PWD-PHED, and shall pay full compensation to any affected parties.	CC	Rising main, supply & distribution network & WTP, Boosters and reservoir sites	Part of standard contract
Loss of fertile top soil *Description*. Development of waterworks and boosters campus on			• Remove the top soil for a depth of 0.3 m (1 feet) and stock separately • This may be used within the	CC	WTP & Boosters site	Part of standard contract

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
agriculturally fertile land (6.4 ha) will lead to loss precious fertile top soil.			site or on demand it may be provided to local farmers			
Cutting of trees *Description*. Road side trees are very limited along KMP Express way and road network in Nuh area. Pipelines will be laid avoiding trees; alignment will be altered slightly to save the trees, wherever possible during the work. There are no trees in reservoir sites. There are few trees in WTP site, which may need to cut.	L	P	• No trees shall be cut/pruned for laying pipeline • Only remove trees if it cannot be avoided at WTP site • Plant and maintain two trees for every one removed	CC	All construction sites	Part of standard contract
Impacts due to improper mining for construction materials *Description*. Large quantities of construction material like sand and aggregate will be required for WTP and reservoir constructions. As the excavated soil will be used for refilling trenches, pipeline construction will require minor quantities. Normally material for Nuh is procured from licensed mines - sand from Delhi (Yamuna River), and aggregate from Mohindergarh and Bhiwani District.	L	P	• Ensure that construction materials (sand, aggregate and gravel) are obtained from quarries licensed by GoH (Directorate of Geology and Mining).	CC	NA	Part of standard contract

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
Shops and other business may loose income if costumer's access is impeded, sites of social/cultural importance and residential areas *Description*. Nuh is a small town and does not have large trade & industrial units. Yet some of the shops may come in alignment of pipe line.	L	T	• Consult local people: inform them of work in advance • Leave spaces for access between mounds of soil • Provide walkways and metal sheets to maintain access across trenches for people and vehicles where required • Increase workforce in these areas to finish work quickly • Informing all residents and businesses about the nature and duration of any work well in advance so that they can make preparations if necessary • Storage facilities and other temporary structures on-site shall be located such that they have as little visual impact as possible • Special attention shall be given to the screening of highly reflective materials on site • In areas where the visual environment is particularly important or privacy concerns for surroundings exist, the site may require screening. This could be in the form of shade cloth, temporary walls, or other suitable materials prior to the beginning of	CC	Rising main, Supply & distribution network sites	Part of standard contract

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
			construction. • The signs and barriers shall be adequately illuminated at night and kept clean and legible at all times • For the duration of the works the contractor shall at all times provide convenient access to paths, steps, bridges, crossings or drives for all entrances to property abutting the site and maintain them clear, tidy and free from mud and objectionable matter and • Before setting out for the work the contractor shall inform the inhabitants of the area through appropriate means (bill board display, leaflet distribution, announcement on radio and TV, publishing in the widely circulated daily newspapers) atleast 7 days (or as directed by the PWD-PHED) before commencement of any work.			

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
Water scarcity for the residents during replacement/rehabilitation of pipe line Description: During replacement of existing pipe lines, residents will be intimated about the work and supply necessary water for 2 days storage capacity	L	T	• During Rehabilitation/ replacement of pipe work the disconnected consumers have to be provided with alternative water source sufficient to meet their daily requirement. • The consumers have to be well informed about the arrangement.	PWD-PHED		
Excavation could damage existing infrastructure *Description*. Water supply lines will be laid along/within the road avoiding telephone/electricity infrastructure. As in most of the areas, water supply lines already exist, and therefore there is no major interference with the other infrastructure. But it cannot be altogether avoided.	L	P	• Identify the services to be affected in each zone • Coordinate with respective agencies (telephone & electricity department) in shifting those infrastructure • Provide prior public information about the likely disruption of services • Provide alternate arrangements for services like water supply in the event of disruption beyond reasonable time, for instance, through tankers	PWD - PHED & CC	Rising main, Supply & distribution network sites	Part of standard contract
Traffic, people and activities could be disturbed due to laying of water supply lines *Description*. No alignment of the pipes is passing through the town area. It is to	M	T	• Provide information to the public through media – daily news papers and local cable television (TV) services, about the work (nature & schedule) likely disturbances, and need and schedule of road closure if any, and	CC	Rising main, Supply & distribution network sites	Part of standard contract

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
be laid along road network leading to various villages, which does not have much of Commercial activity. Yet, construction work will affect the people, activities and business for a small period.			alternative routes. This shall provide locality/village -wise information (where &when the work will be taken up and when it will be completed) • Ensure that the work is completed as scheduled; ensure that well experienced contractors are engaged and discourage delays by suitable penalties built into the contracts • Plan work such that trench excavation, pipe laying, and refilling including compacting, at a stretch is completed in a minimum possible time • Avoid complete closure of road; ensure that work is conducted onto edge of the road; allow traffic to move on one line • Do not deploy heavy/large equipment, which will occupy & disturb traffic/people movement; if necessary use only during light traffic hours (6 AM – 10 AM) • In unavoidable circumstances of road closure, provide alternative routes, and ensure that public is informed about such traffic diversions			

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
			• At all works sites public information/caution boards shall be provided (name of the project, cost, schedule, contractor name, implementing & executing agency, schedule of work at that locality, details of traffic diversion, responsible officer for implementation and receiving complaints)			
Increase in traffic due to trucks carrying construction material &waste	L	T	• Plan routes to avoid narrow streets, congested roads, and places of religious importance • Plan work to avoid peak traffic hours	PWD - PHED & CC	All construction sites	Part of standard contract
Sites of archeological remains & monuments may be distributed *Description*. There is one monument within the subproject area (Chuhimal ki Haveli). Works will not disturb this site, as, this is located in the old city area, and no pipe is proposed to be laid nearby that area. Excavations for laying of pipelines within 300 m of sites requires permission from ASI. However, no impacts on these sites are anticipated considering the present	L	T	• No infrastructure, except unavoidable water supply pipe lines, shall be constructed within the 300 m of sites. • Obtain permission from ASI for laying of pipelines within 300 m of sites. • Ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved. • If any chance finds are recognized, the Contractor should:	PWD - PHED & CC	Rising main, Supply & distribution network sites	Part of standard contract

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
development around the sites.			○ Stop work immediately to allow further investigation if any finds are suspected; ○ Inform PWD - PHED; call in the ASI if a find is suspected, and taking any action they require to ensure its removal or protection in situ.			
Site of social/cultural importance (schools, hospitals and religious places) may be distributed by noise, dust, and impeded access during laying of pipelines. *Description*. In addition to ASI monuments listed above, there are a number of schools, religious places of local importance.	L	T	• avoid work at sensitive times, such as religious and cultural festivals • Remove waste quickly, cover/spray stockpiles, cover soil/sand on trucks • Increase workforce to finish work quickly • Use wooded planks and metal sheets to allow access (people/vehicles) • Use modern vehicles/machinery & maintain as specified to reduce noise and exhaust emissions	CC	Network sites	
Workers and public at risk from accidents on site *Description*. Excavations for distribution lines will be mostly limited to 1.1 m except few which may 1.4 m deep.	M	T	• Follow standard and safe procedures for all activities – such as provision of shoring in trenches of 2 m or more • Consulting the town authorities to identify any buildings at risk from vibration damage and	CC	All construction sites	Part of standard contract

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
Rising main – 1.3 m to 2 m. Excavations for foundations (WTP and reservoirs) may go to a depth of 5-10 m. Public will be at risk as trenches for pipelines will be located along the roads.			avoiding any use of pneumatic drills for cutting roads; • Excluding the public from the site – enclose the construction area, provide warning/sign boards • Ensuring that all workers are provided with and use appropriate Personal Protective Equipment (helmet, hand gloves, boots, masks etc); • Report accident and maintain records			
Economic benefits for people employed in workforce	L	T	• Ensure that most of the workforce is from local communities	CC	All sites	-
Operation and Maintenance						
Pollution and health risk due to indiscriminate disposal of backwash water & sludge. *Description*. It is designed to re-circulate backwash water. Sludge is collected in sludge tanks (2 tanks for alternative use), and dried and is disposed off in filling depression in the WTP area. Sludge can be used as soil conditioner. Operation manual will be provided for operation & maintenance of WTP including backwash & sludge handling &	L	P	• Operate WTP promptly with standard procedures as per the operating manual to be developed by the WTP contractor • Conduct periodic testing of sludge ensure that it is harmless and can be used as soil conditioner	PWD - PHED	WTP site	

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
treatment.						
Pollution of water source & delivery of unsafe water to consumers due to WTP malfunction *Description*. This dedicated lined canal carries very clear water and have very little of turbidity and contamination. The water quality of canals is monitored by Pollution Control Board. Water quality of canals meet the criteria - "fit for drinking after conventional treatment." As part of the project design, a water quality testing laboratory will be set-up within the WTP to check the raw water quality and treated water quality daily at regular intervals.	L	P	• Ensure regular water quality monitoring • Liaison with Haryana State Pollution Control Board and obtain canal water quality data regularly • Ensure operation of WTP as per standard procedures • Conducting random monitoring of water quality at storage reservoirs and at consumer end	PWD - PHED	NA	Part of project design
Increased sewage generation due to increased water supply *Description*. Currently average per capita water supply is 62 lpcd, which will increase to 135 lpcd with implementation of this subproject. Sewage generation in Nut Town will go up from 10 MLD (2012) to 21 MLD (2027), 25 MLD (2042). At present about 40 % of the project area is covered with	M	P	• Provide sewerage system on priority to the entire project area • Implement sewerage master plan of Panipat prepared under Yamuna Action Plan	PWD - PHED	Project area	-

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
sewerage system.						
Potential health & safety risk due to handing & application of chlorine in WTP *Description*. Large volumes of chlorine will be stored and used for disinfection of water in the WTP. Chlorination plant will be developed with all safety features and equipment to meet with any accidental eventuality. These include: mechanical container handling facility, chlorine neutralization pit with a lime slurry feeder, facility isolation plan, and alarm systems to detect chlorine gas leakage. Operation manual will be provided for chlorinators for O&M and repairs.	M	P	• Operate chlorinators promptly with standard procedures as per the operating manual of manufacturer • Provide necessary personal protection equipment to the staff • Provide training in operation & maintenance of WTP. The Turnkey contract for WTP shall include staff training.	PWD - PHED	WTP site	Part of project design
Power consumption *Description*. The annual power consumption of raw & clear water pumping stations is estimated **500** KWH	L	P	• Ensure operation and maintenance as per the standard procedures of the manufacturers • Replace pumps & motors for every 15 years	PWD - PHED	WTP site	Part of project design

Potential Negative Impacts	Sig	Dur	Mitigation measures	Responsibility	Location	Cost
and 7788 KWH per day respectively. No estimate of WTP power is available at this stage. All pumps will be designed & procured for maximum efficiency. Regular and prompt maintenance and replacement after 15 years will be ensured. Entire bulk water supply system will be operated via SCADA to increase the efficiency and reduce the power consumption among others						
Disturbance to people, traffic and activities due to repair & replacement of sewers especially near schools, hospitals, temples, etc.	I	T	• Consult people – inform about work nature and schedule • Provide walkways and metal sheets to maintain access across trenches for people and vehicles where required	PWD - PHED	Pumping main & distribution network sites	Routine O&M

ASI – Archeological Survey of India; CC – Construction Contractor; I - Insignificant; L- Low; M – Medium; PWD-PHED –Public Works Department – Water Supply & Sanitation Division; O&M – Operation & Maintenance; P – Permanent; T – Temporary; SCADA – Supervisory Control & Data Acquisition

Table 6.2**: Environmental Monitoring Plan**

Mitigation measures	**Location**	**Responsible for Mitigation**	**Monitoring Method & Parameters**	**Monitoring Frequency**	**Responsible for monitoring**	**Cost**
Pre-Construction						
Air Quality		DPR consultant	SPM and RSPM, NOx, CO	Once prior construction	PWD-PHED	4000/sample
Noise	At two locations along the rising main alignment and two locations where WTP is proposed and networks to be developed	DPR consultant	Decibels	Once prior construction	PWD-PHED	1000/sample
Water Quality	At water source	DPR consultant	Surface water quality	Once prior to construction	PWD-PHED	2000/sample
Site for quarries and borrow pits	All sites identified for quarries, borrow pits, waste and construction labour camps and offices	DPR consultant/Agency identified to supervise construction	The site situation- for rehabilitation, photographs	Once prior to construction	PWD-PHED	30,000 lump sum

Vegetation removal	Locations that are to be cleared off trees for construction activities	DPR consultants	Vegetative survey to identify type and amount of vegetation that requires to be replaced	Once prior to construction	PWD-PHED	300000 lump sum
• Implement compensatory measures as recommended by the RP • Implement LA and R&R measures before the signing of contract	WTP & Booster Sites	PWD - PHED	PWD - PHED records; PAPs interview	As needed	NCRPB	Part of RP implementation cost
• Obtain water allocation from GWSC – 14.36cusecs • All existing tube wells of PWD - PHED in 18 zones must be closed once the canal-based system is functional • All tube wells used by individual households must also be closed.	NA	PWD - PHED	PWD - PHED records Household survey	As needed before LA As needed after start of new system After 1 year of operation	NCRPB	Part of project management costs
Construction						

Air Quality	At two locations along the rising main alignment and two locations – at WTP and where networks to be developed	Contractor	SPM and RSPM, NOx, CO The monitoring results shall be compared with baseline values (prior to start of construction) of respective parameters; this will be threshold and any increase of value requires a corrective action by contractor	Thrice annually	PWD-PHED	4000/sample
Noise	At two locations along the rising main alignment and two locations – at WTP and where networks to be developed	Contractor	Decibels The monitoring results shall be compared with baseline noise levels (prior to start of construction); this will be threshold and any increase of value requires a corrective action by contractor	Thrice annually	PWD-PHED	1000/sample

Water Quality	At two water body locations along the rising main	Contractor	Surface water quality The monitoring results shall be compared with baseline values (prior to start of construction) of respective parameters; this will be threshold and any increase of value requires a corrective action by contractor	Thrice annually	PWD-PHED	2000/sample
Site for borrow pits, construction camps	Quarries, borrow pits, labour camps and office sites	Contractor	Post construction – After construction activity over – if rehabilitated	After completion of construction activities at site	PWD-PHED	40,000 total

Utilize surplus soil for following activities in order priority: • Utilise for filling of deep borrow-pits of road section. • Allow KMP express way to utilise in their earth work. • Utilize for raising the ground-level of construction sites • Utilize in other construction works of other departments around Nuh. • Provide to local people for filling up low laying areas.	Rising main, Supply & distribution network sites	CC	Observations on-site/off-site; CC records;	Weekly	PWD - PHED	Part of construction supervision costs

Water accumulation in trenches during rains and related impacts • Avoid scheduling of excavation work during monsoon • Complete work in excavated stretches before monsoon • Regulate drainage by earthen bunds, if required • Cover or damp down soil mounds to control dust • Apply water prior to leveling/ any earth moving activity • Bring the material (aggregate) as and when required • Ensure speedy completion of work • Use tarpaulins to cover loose material in transport • In case of surplus soil is provided for other departments or private persons, it will be the responsibility of contractor to ensure that it proper handling, transport & utilization • Use tarpaulins to cover loose material/soil that is transported to and	All construction sites	CC	Observations on-site/off-site; CC records;	Weekly	PWD - PHED	Part of construction supervision costs

• Provide prior information to the local public about the work • Do not conduct noise generating activities in the night • Do not use pneumatic drills near old and sensitive buildings • Employ manual methods, where required	Rising main, Supply & distribution network & WTP, Booster sites	CC	Observations on-site/off-site; people interviews; CC records	Weekly	PWD - PHED	Part of construction supervision costs
• No trees shall be cut/pruned for laying pipeline • Only remove trees if it cannot be avoided at WTP site • Plant and maintain two trees for every one removed	All construction sites	CC	On-site observation; CC records	Weekly	PWD - PHED	Part of construction supervision costs
• Procure construction material from licensed quarries	NA	PWD - PHED	CC Records	Weekly	PWD - PHED	Part of construction supervision costs

• Consult local people: inform them of work in advance • Leave spaces for access between mounds of soil • Provide walkways and metal sheets over trenches • Increase workforce in these areas to finish work quickly	Rising main, Supply & distribution network sites	CC	Observations on-site/off-site; people interviews; CC records	Weekly	PWD - PHED	
• Identify the services to be affected in each zone • Coordinate with respective agencies (PWD - PHED – sewerage section; telephone & electricity department) • Provide prior public information • Provide alternate arrangements for disturbed services	Rising main, Supply & distribution network sites	PWD - PHED & CC	Observations on-site/off-site; people interviews; CC records	Weekly	PWD - PHED	Part of construction supervision costs

• Provide information to the public • Ensure that the work is completed as scheduled; and discourage delays by suitable penalties built into the contracts • Plan to complete work in minimum time (excavation to refill) • Avoid complete closure of road; allow one-line traffic • Do not deploy heavy/large equipment in narrow streets,; if necessary use only during light traffic hours (6 AM – 10 AM) • Provide alternative routes in case of road closures • Provide public information/caution boards at all sites	Rising main, Supply & distribution network sites	CC & PWD - PHED	Observations on-site/off-site; people interviews; CC records	Weekly	PWD - PHED	Part of construction supervision costs
• Avoid narrow streets/ congested areas/sensitive areas for material transport • Plan work to avoid peak traffic hours	All construction sites	PWD - PHED & CC	Observations on-site/off-site; CC records	Weekly	PWD - PHED	Part of construction supervision costs

• Obtain ASI permission for laying of pipelines in regulated area • Ensure that any chance finds are recognized and measures are taken to ensure they are protected and conserved. • If any chance finds are recognized, the contractor should stop work immediately; inform PWD - PHED; call in the ASI.	Rising main, Supply & distribution network sites	PWD - PHED & CC	Observations on-site; CC records; interview with ASI staff	As needed	NCRPB	Part of construction supervision costs
• avoid work at sensitive times (religious/cultural festivals) • Remove waste quickly, cover soil/sand on trucks • Increase workforce to finish work quickly • Use wooded planks and metal sheets to allow access • Use modern vehicles/machinery & maintain as specified	Rising main, Supply & distribution network sites	CC	Observations on-site/off-site; people interviews; CC records	Weekly	PWD - PHED	Part of construction supervision costs

• Follow standard and safe procedures for all activities • Consulting the town authorities to identify any buildings at risk • Enclosing the construction area, provide warning/sign boards • Provided Personal Protective Equipment to workers • On/off-site Health and Safety Training for all site personnel; • Report accidental and maintain records	All construction sites	CC	Observations on-site; worker interviews; CC records	Weekly	PWD - PHED	Part of construction supervision costs
• Ensure that most of the workforce is from local communities	All sites	CC	Worker interviews; CC records	Randomly	PWD - PHED	Part of construction supervision costs
• Water quality monitoring of GWSC	Monitoring point just downstream of WTP construction site	Contractor	pH, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, Total Alkalnity	Once before start of construction Quarterly during construction (4-times a year)	Contractor	Part of EMP costs

• Ambient Air Quality monitoring	At 5 locations in sub-project area	Contractor	Sox, Nox, SPM	Quarterly once during construction (4 times a year)	Contractor	INR 3000 per sample
Defect Liability						
• Noise	WTP	Operating Agency	Decibels	Thrice in a year	PHED	Part of Defect liability
• Water Quality	WTP	Operating Agency	pH, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, Total Alkalnity	Daily	PHED	Part of Defect liability
• Sludge testing	WTP	Operating Agency	Electric Conductivity, Moisture Content, % of organic carbon, Iron (Fe), Aluminum (Al)	Yearly once	PHED	Part of Defect liability
Operation Stage						
• Conduct periodic sludge testing	WTP	Operating Agency	Electric Conductivity, Moisture Content, % of organic carbon, Iron (Fe), Aluminum (Al)	Yearly Once	PWD - PHED	Part of laboratory O&M Costs
• Conducting regular monitoring of water quality	WTP	Operating Agency	pH, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, Total Alkalnity	Daily	PWD - PHED	

	Consumer end-random sampling in all zones	PWD - PHED	pH, Cl, F, NO3, TC, FC, Hardness, Turbidity BOD, Total Alkalnity	Yearly once	-	Part of laboratory O&M Costs

ASI – Archeological Survey of India; CC – Construction Contractor; O&M – Operation & Maintenance; PWD-PHED –Public Works Department – Water Supply & Sanitation Division

B. Environmental Management and Monitoring Costs

5. Most of the mitigation measures require the Contractors to adopt good site practices, which are part of their normal procedures, so there are unlikely to be major costs associated with compliance. These costs of mitigation by the contractors are included in the budgets for the civil works. Mitigation and monitoring provided by the IA/EA or its DSC will be part of incremental administration costs, which are already included in the project. Additional costs required for environmental quality monitoring is indicated in the following **Table 0-1**.

Table 0-1**: Environmental Management and Monitoring Costs**

Item	**Quantity/Details**	**Total Cost**
I. Project Implementation Phase		**INR**
Monitoring of implementation of mitigation measures	Regular monitoring by IA	Part of supervision costs
	Periodic monitoring/overseeing by EA	Part of operational costs of ESMC of NCRPB
Canal water quality monitoring (two canals)	Quarterly monitoring 9x2 samples	45,000
Ambient Air Quality monitoring	Quarterly monitoring 3x5 samples	52,500
II Operation & Maintenance Phase		
Regular water quality monitoring	Daily sampling	Part of laboratory O&M costs
Random quality testing at consumer end in all zones	Yearly once	Part of laboratory O&M costs

CHAPTER -7

RIEVANCE REDRESS MECHANISM

As the work is being done along inhabited areas and areas with various human activities, and most of the impacts are construction-related, and therefore it is anticipated that improper or inadequate implementation of EMP may lead to disturbance and inconvenience to local people and traffic. In order to provide a direct channel to the affected persons for approaching project authorities and have their grievance recorded and redressed in an appropriate time frame, PHED will establish a Grievance Redress Mechanism, which will be functioned throughout the construction period.

A Complaint receiving system will be put in place at the project office of PHED in Project Area. A complaint register and complaint forms will be made available at the site office of each contractor, with a display board indicating availability of such facility. This will accept complaints regarding the environment safeguard issues in implementation of the project. The grievances received and actions taken will be included into the environmental monitoring reports submitted to NCRPB.

PHED will constitute a three-member Grievance Redressal Committee (GRC) comprising of the Executive Engineer, PHED, (jurisdictional EE), the elected member of the project area and one member from the public who is known to be persons of integrity, good judgment and commands respect among the community. The existence of the GRC will be disseminated to the villagers through printed handouts providing details of the structure and process in redressing grievances. Any aggrieved person (whose complaint to the complaint cell is not redressed to his/her satisfaction) can approach GRC, chaired by the Executive Engineer, PHED and if the grievance is not addressed, the aggrieved person will be directed to approach the District Collector. The aggrieved person will have the right to approach the court of law, if he/she is still unsatisfied with the decisions taken by the GRC and the Collector.

The GRC will meet every month, determine the merit of each grievance, and resolve grievances within a month of receiving the complaint; failing which the grievance will be addressed by the District Collector. If not satisfied, the affected households will have the option of approaching the appropriate courts of law. Records will be kept of all grievances received including: contact details of complainant, date that the complaint was received, nature of grievance, agreed corrective actions and the date these were affected, and final outcome.

CHAPTER -8

Public Consultation and Information Disclosure

7.1 Process of Consultation Followed

1. 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 7.1 below.

Table 7.1

Summary of Consultations

S. No.	Place	Date	Number of participants	Participants	Issues discussed
1	PHED, Palwal Office	26 October, 2009	4	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 AC/PVC 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	Nuh	10 November, 2009	3	Elected representatives	Requirement for a water supply system that ensures even pressure to all parts of the town with proper daily water allowance 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

S. No.	Place	Date	Number of participants	Participants	Issues discussed
					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.
3	Nuh	10 November, 2009	15	Councillors	Since there are a number of drinking water tubewells in the town the water of these tubewells gets contaminated by the sewage, leading to diarrhoeal diseases. The demand for a sewerage system is higher than that of water in Nuh 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
4.	Nuh to various villages	12 November, 2009	10	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.
5.	Nuh town	12 November,	16	Residents	All persons discussed with understand the benefits for a improved water

S. No.	Place	Date	Number of participants	Participants	Issues discussed
		2009			supply and sewerage system and would like the town to have a proper system.
6.	Badli	16 November, 2009	8	Land owners	They wanted to know about payment, terms & conditions of payment, time schedule of payment etc.
7	Badli	March	12	Land owners	They wanted to know about Annuity
8	Nuh	March	10	Public/Councillors	Wanted to know the progress of work.

7.2 Summary of consultations

The water supply Nuh and 18 adjoining villages is based on tubewells located in foothills of Aravali. The quality and quantity is deteriorating with passage of time year by year. Public was making hue and cry due to shortage of water. Sinking of more tubewells is banned. The public Health officers of Palwal Circle held a meeting at Palwal on 26th. October 2009. It was decided to prepare a project for construction of canal based water supply scheme, with WTP at Badli. It was decided to carryout reconnaissance survey and public consultation along with preparation of project. After reconnaissance survey the tentative sites were finalized. The first public consultation was done by the field officers of Public Health Engineering Project Division no.1 Nuh, fro 26 October to 12 November 2009. It was carried out with elected councilors of Municipality Nuh on 10th November 2009. All were in agreement with proposal of PHED. On 10th November, another meeting was held with the residents of the town, the proposal was explained to them. They were all in agreement with the proposal of department. They even gave consent for increase in rates of water supply, in case they get assured and minimum desired level of supply, as they can save from the cost water being spent by them on procurement by them through tankers. They indicated that they can bear a temporary loss due to closure of access to their shops on account of laying of pipe lines. Simultaneously, a meeting was held with villagers of 18 adjoining villages, and similar feelings were expressed. Thereafter a meeting was held at village with landowners to obtain their views about acquisition of their land. Majority of them were interested to know about compensation, time for release of payment and priority in employment in government job.

EE explaining project to councilors

EE explaining project related issues to residents

7.3 Framework for continued public participation

2. 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.

3. 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 Nuh, (ii) Office of the District Commissioner, Mewat 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 Nuh, 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.

CHAPTER- 8

Findings and Recommendations

8.1 Findings

4. 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.

5.

6. 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.

7.

8. 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.

CHAPTER - 9

Conclusions

9.1 Conclusions

The project will have a number of benefits such as availability of clean and sufficient drinking water to all the residents of Nuh and adjoining villages. 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.

CHAPTER-10

Appendices

10.1 REA Checklist

WAT1.1ER 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: Nuh 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?			

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…			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 booster structures will create displacement and is to addressed in the Resettlement Plan

SCREENING QUESTIONS	Yes	No	REMARKS
▪ 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?	☐	■	
▪ 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

SCREENING QUESTIONS	Yes	No	REMARKS
▪ 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?	☐	■	
▪ 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 separate sewerage system is also planned
▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant	☐	■	

Nuh Water Supply Project

PUBLIC CONSULTATIONS, NCRPB

Sr. No.	Name S/Shri	Designation	Address	Signature
1	कृपाल S/o चतरसिंह	पंच ग्राम बादली	V.P.O. बादली	कृपाल
2.	सरपंच S/o रोशनलाल	पंच ग्राम बादली	V.P.O. बादली	सरपंच
3	ओमप्रकाश S/o श्रीराम चरेवा	निवासी ग्राम बादली	VPO बादली	
4.	विजय पाल	निवासी बादली	V.P.O. बादली	Vijaypal.
5.	मांगेराम S/o रामकिशन	निवासी बादली	V.P.O. बादली	मांगेराम
6.	शेरदास कुमार	J.E- P.H. Delhi	V.P.O. Najafgarh	
7.	रामकिशन S/o नरसिंह	Land owner	V.P.O. Badli	
8	Rakesh Kumar	Patwari	VPO Bhondsi	

Sr. No.	Name of Members with Address	Ward No.	Single Member Sign.
1	RASIDAN W/o MAKSOOD AHMED Hamid Colony, NUH (mewat)	1	श्रीमती रसीदन पार्षद वार्ड न0 1 नगरपालिका नूह मेवात 8053270075
2	HARICHAND S/o Foolchand Kumhar mohalla, NUH (mewat)	2	Harichand HARICHAND Municipal Councellor Ward No.-2, Nuh 9416353537
3	BABU LAL S/. CHETRAM NUH (mewat)	3	Babu Ram Ch. Babu Ram Ward No. 3 Municipal Councellor M.C. (Mewat) 9253323470
4	SANJAY KUMAR S/o KANSHIRAM Jung mohalla NUH (mewat)	4	S. Manjay 9416316212
5	SANNI S/o KANHIYA LAL old Anaj mandi NUH (mewat)	5	Manoj Nangal Manoj Bansa Ward No.5 Municipal Councilor M.C. Nuh (Mewat) 9812722293
6	Ayyub S/o BHOORA madina Colony NUH (mewat)	6	अय्यूब खान पार्षद वार्ड नं. नगरपालिका नूंह 9812731071
7	MOHD. SALMAN S/o MOHD ISHAK NUH (mewat)	7	Municipal Councellor W. No. 7 (Mewat) 9813000702

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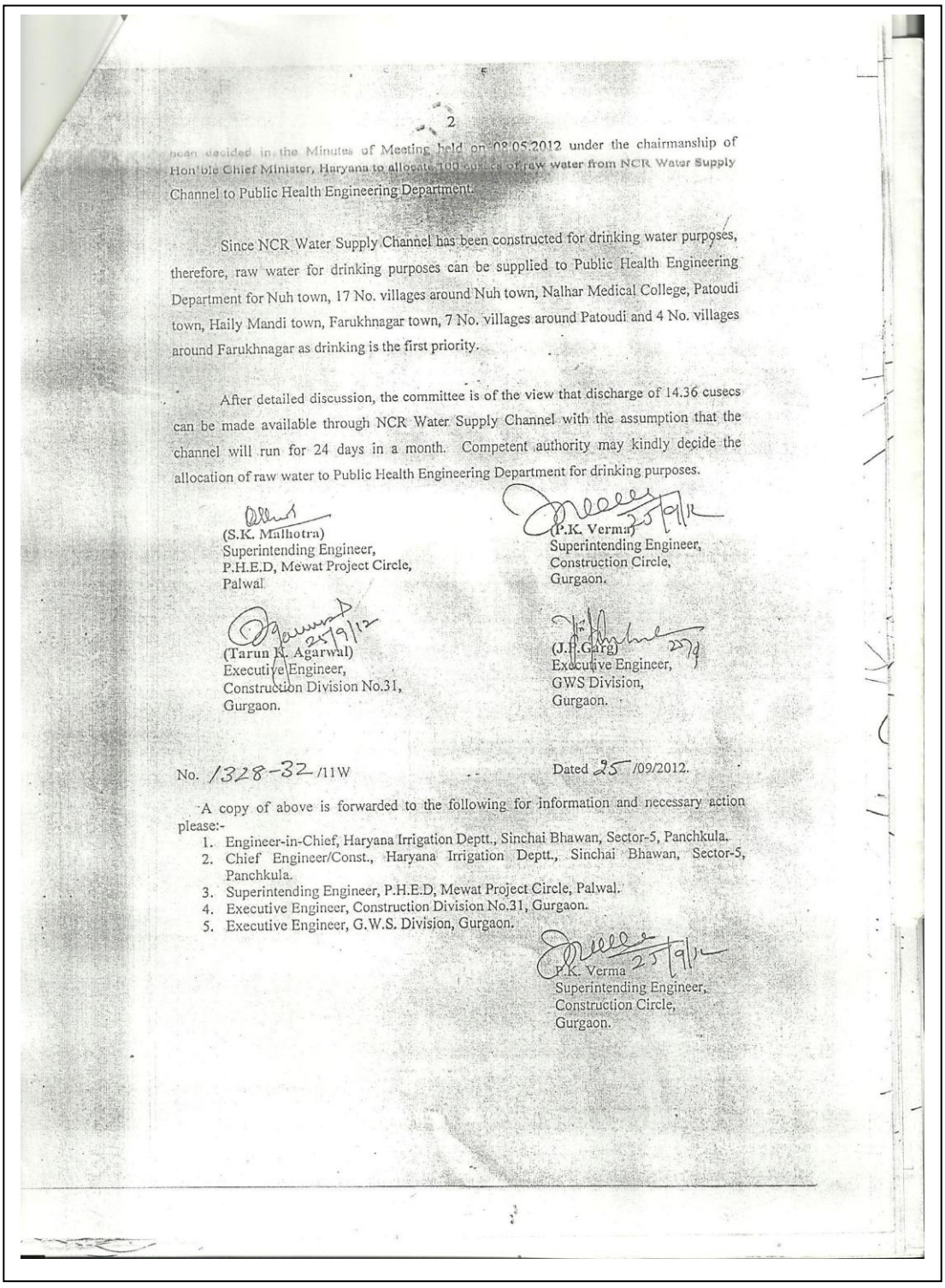
Minutes of meeting held on 25.09.2012 at 11:00 AM in the office of Superintending Engineer, Construction Circle Gurgaon (Irrigation Department) for consent for raw water to drinking water supply schemes as per Sanitary Board Resolution No.31 of meeting held 07.05.2010 for Water Supply Scheme for Nalhar Medical College & Nuh Town, Farukh Nagar and Patuadi Town under NCR-PB and surrounding villages.

The meeting was attended by the following Officers:-

1. Sh. P.K. Verma, Superintending Engineer, Const. Circle, Gurgaon (Irrigation Department).
2. Sh. S.K. Malhotra, Superintending Engineer, PHED, Mewat Project Circle, Palwal.
3. Sh. Tarun K. Agarwal, Executive Engineer, Const. Division No.31, Gurgaon.
4. Sh. J.P. Garg, Executive Engineer, GWS Division Gurgaon.

This is in continuation to the meeting held on 18.08.2011 at 11:00 AM in which Superintending Engineer, Const. Circle Gurgaon (Irrigation Department) has agreed to consent for availability of raw water 5.11 Cusecs at RD 55.800 KM from NCR Channel out of the balance provision at RD 32.095 KM for Nalhar Medical College and Nuh Town under NCR-PB and surrounding villages and same was recommended to the Engineer-In-Chief , Irrigation department, Haryana Panchkula. Now Superintending Engineer, PHED, Mewat Project Circle , Palwal has submitted the revised demand on supercession of earlier demand. Superintending Engineer, PHED, Mewat Project Circle, Palwal has intimated that the proposal has been revised and instead of constructing 3 No. Canal based water works it has been proposed to construct 1 No. Canal based water works at Badli. The total requirement of raw water for the combined water works which includes the raw water requirement of Nalhar Medical College and Nuh Town, Farukh Nagar and Pataudi Town and surrounding villages comes to 14.36 Cusecs at K.M. 55.800 of NCR Water Supply Channel. The discharge of 14.36 Cusecs has been calculated based on 2001 census for present population for the base year 2014 and prospective population for next five years i.e. 2019. It has been explained by Superintending Engineer, PHED that the revised discharge have been calculated on the basis of drinking water norms adopted by Public Health Engineering Department sent to Engineer-in-Chief, Haryana Irrigation Department, Panchkula vide memo No.13216-PHE/Plg. dated 10.09.2012 by Engineer-in-Chief, Public Health Engineering Department, Panchkula. The norms have also been endorsed to all Superintending Engineers by Executive Engineer/Works office of Engineer-in-Chief, Haryana Irrigation Department, Panchkula vide letter No.1702-37/Xen/W/12 dated 12.09.2012. The norms for drinking water supply are as per Manual on Water Supply and Treatment, Third Edition-Revised and Updated by Central Public Health and Environment Engineering Organisation, Ministry of Urban Development, New Delhi Edition May, 1999.

As far as share of Public Health Engineering Department for supply of raw water for various drinking water supply schemes of villages and towns in four districts namely Sonepat, Jhajjar, Mewat and Gurgaon from NCR Water Supply Channel is concerned, it has



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been decided in the Minutes of Meeting held on 08.05.2012 under the chairmanship of Hon'ble Chief Minister, Haryana to allocate 100 cusecs of raw water from NCR Water Supply Channel to Public Health Engineering Department.

Since NCR Water Supply Channel has been constructed for drinking water purposes, therefore, raw water for drinking purposes can be supplied to Public Health Engineering Department for Nuh town, 17 No. villages around Nuh town, Nalhar Medical College, Patoudi town, Haily Mandi town, Farukhnagar town, 7 No. villages around Patoudi and 4 No. villages around Farukhnagar as drinking is the first priority.

After detailed discussion, the committee is of the view that discharge of 14.36 cusecs can be made available through NCR Water Supply Channel with the assumption that the channel will run for 24 days in a month. Competent authority may kindly decide the allocation of raw water to Public Health Engineering Department for drinking purposes.

(S.K. Malhotra)
Superintending Engineer,
P.H.E.D, Mewat Project Circle,
Palwal

(P.K. Verma) 25/9/12
Superintending Engineer,
Construction Circle,
Gurgaon.

25/9/12
(Tarun K. Agarwal)
Executive Engineer,
Construction Division No.31,
Gurgaon.

(J.P. Garg) 25/9
Executive Engineer,
GWS Division,
Gurgaon.

No. /328-32 /11W Dated 25 /09/2012.

A copy of above is forwarded to the following for information and necessary action please:-

1. Engineer-in-Chief, Haryana Irrigation Deptt., Sinchai Bhawan, Sector-5, Panchkula.
2. Chief Engineer/Const., Haryana Irrigation Deptt., Sinchai Bhawan, Sector-5, Panchkula.
3. Superintending Engineer, P.H.E.D, Mewat Project Circle, Palwal.
4. Executive Engineer, Construction Division No.31, Gurgaon.
5. Executive Engineer, G.W.S. Division, Gurgaon.

P.K. Verma 25/9/12
Superintending Engineer,
Construction Circle,
Gurgaon.

BRIEF NOTE ON CONSTRUCTION OF N.C.R. WATER SUPPLY CHANNEL FOR 800 CS. DISCHARGE OFF TAKING AT RD 223300-R DELHI BRANCH

G.W.S. Channel was constructed to meet with the drinking water requirement of Bahadurgarh and Gurgaon town for a discharge of 135 cusecs during 1993-94. Out of which 35 cusecs was for Bahadurgarh Town. This was a deposit work executed by Irrigation Department for HUDA.

In view of Hon'ble Chief Minister Haryana announcement on 5.2.2001 it was envisaged to remodel the existing channel for increasing its capacity from 135 cusecs to 320 cusecs after receipt of confirmation of discharge from beneficiaries department. The project estimate comprising two proposals i.e mixed proposal & parallel proposal was framed for amounting to Rs. 73 crores and Rs. 94 crores respectively and put up in the various meetings. In the meeting held under the Chairmanship of F.C.I.P. on 9.8.2004 the mixed proposal comprising of widening, parallel channel & raising of the channel was accepted and project estimate for

Rs. 73 crores was received duly approved by the Govt. vide letter No. 1/2004/1-W dt. 22.11.2004.

In addition to above a communication from Chief Administrator H.U.D.A., Panchkula as received vide his D.O. letter No. PA EIC-2005/94 dated 24.11.2005 through worthy F.C. & P.S. to Government Haryana Irrigation Department, Chandigarh vide which it was directed to plan G.W.S. Channel for a total capacity of 550 cusecs in place of 320 cusecs. A letter from Public Health authorities was also received to increase the capacity from 15 cusecs to 46 cusecs. The project estimate was prepared for the above revised capacity of 565 Cs. amounting to Rs. 189.13 crores.

In the meantime a Fax Message from EIC office was received vide No. 213-14/EIC dt. 30.3.2006 to plan the G.W.S. Channel for a discharge of 700 Cs. at head. Accordingly the proposal for additional discharge of 565 Cs. was sent to Chief Engineer/Constn. alongwith other proposals for consideration. A Fax Message of Hon'ble Financial Commissioner, Irrigation was also received vide Endstt. No. 1027/CU dated 19.5.2006 for constructing parallel G.W.S. Channel for constructing IInd Canal parallel canal for water supply to the proposed industrial townships

and to meet the future needs of Gurgaon and Manesar areas as well as rural water supply schemes of Jhajjar District. After considering these proposals this office was again directed by worthy E.I.C, Irrigation Deptt. Haryana, Panchkula on phone dt. 2.6.2006 to prepare and submit the detailed project report for constructing parallel G.W.S. Channel for a discharge of 700 Cs. minus 135 Cs. of existing G.W.S. Channel and discharge of the raising of FSL by 1.5' of existing G.W.S. Channel from head to tail. An alternate alignment along Rohna Minor and then along Dulhera Disty. was presented before worthy Engineer-in-Chief, Irrigation Deptt. Haryana, Panchkula on dated 16.6.2006 further it was desired that the alignment of the channel of 565 Cs. discharge may be proposed in such a way so that length of the channel can be minimized and the route of the alignment may be checked by walking on foot.

In compliance of the above directions of worthy E.I.C. the route of alignment was checked and new channel was proposed to off take at RD 225000 of Delhi Branch i.e. 3200 Ft. on U/S of Kakroi Head (RD 227800-R Delhi Branch). This off taking RD was proposed to avoid kink in the channel and to minimize the length too. To make the alignment straight the off take point has been proposed to join Rohna Minor on its right side upto tail and

after that straightly joining near RD 80000 on left side of Dulhera Disty. upto head of Gubhana Minor then it was shifted to right side of the Dulhera Disty. upto RD 142560 and then it was proposed to cross Dulhera Disty. at this point so that the same can be shifted along left side of existing G.W.S. Channel upto its tail. The total length of the proposed G.W.S Channel worked out 72.585 KM. This alignment crosses the Delhi-Rohtak Railway Track at KM 28.700 near village Rohad. The FSL at Railway X-ing was kept same as per the FSL of existing G.W.S. Channel i.e 709.47. The water surface slope from KM 0-28.500 was kept 0.26/‰ whereas from KM 28.500 to 70.460 the WSS was kept 0.09/‰ to attain the similar FSL of existing G.W.S. Channel at KM 65.385. The FSL at this point in existing G.W.S. Channel is 697.75 and the FSL in proposed G.W.S. Channel is 697.93. This channel was proposed to be extended upto KM 72.585 i.e corresponding tail RD of existing G.W.S. Channel i.e 69.385 for a discharge of 600 Cs. to meet with the requirement of HSIDC and Gurgaon Town.

In the meeting held on 19.7.2006 at 11.00 A.M. under the Chairmanship of Financial Commissioner & Principal Secy. to Govt. Haryana, Irrigation Deptt. regarding augmenting canal based water supply to Gurgaon detailed demand submitted by various

organizations and total requirement was assessed as 1000 Cs. as per details given below:-

Sr. No.	Description	Name of agency projecting demand	Requirement (in cusecs)
1.	Gurgaon	HUDA, HSIDC, Sultanpur Lake & Public Health	375
2.	Rural Area	Public Health	80
3.	Bahadurgarh, Sampla & Badli (50 cs. each)	Public Health	150
4.	Reliance-SEZ	HSIDC	135
5.	DLF Universal	HSIDC	108
6.	Orient Craft	HSIDC	2
7.	Other developers	HSIDC	5
8.	For industries at:		
a.	Manesar		54
b.	Bahadurgarh		11
c.	Kharkhoda		27
9.	Losses & theft		60
	Total =		1007

Engineer-in-Chief, Irrigation Deptt. Haryana, Panchkula pointed out that capacity of existing G.W.S. is being augmented to 200 Cs. For the balance he proposed to construct a canal of 600 Cs. with a margin of free board in structures to augment further by another 200 Cs. in future when demand develops. Engineer-in-Chief, Irrigation Deptt. Haryana, Panchkula further intimated that for second water supply channel for NCR, Irrigation Department